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# *1960 Annual Report*

# SECRETARY OF THE
# INTERIOR

FRED A. SEATON

*For the Fiscal Year Ended June 30, 1960*

March 3, 1849

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# *1960 Annual Report*

## SECRETARY OF THE

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FRED A. SEATON

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March 3, 1849

THE SECRETARY OF THE INTERIOR
WASHINGTON

Dear Mr. President: It is a pleasure to transmit to you the annual report of the Department of the Interior for the fiscal year 1960.

This summary of departmental activities has been prepared in the hope that it will bring to public attention the cause of sound conservation and development of our natural resources by increasing public knowledge and understanding of this important area of the Nation's responsibilities.

Great strides have been made and I am certain that they will be continued in the years to come because the groundwork has been carefully laid.

Sincerely,

Fred A. Seaton,
*Secretary of the Interior.*

The President,
*The White House.*

# United States
# Department of the Interior

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# Office of the Assistant Secretary
# *Water and Power Development*

**Fred G. Aandahl,** ***Assistant Secretary***

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

THE ASSISTANT SECRETARY for Water and Power Development discharges the duties of the Secretary with respect to the Department's program in the field of water and power development. Secretarial direction and supervision is exercised by the Assistant Secretary over the Bureau of Reclamation, Bonneville Power Administration, Southeastern Power Administration, Southwestern Power Administration, and Office of Saline Water.

▲ *The Bureau of Reclamation constructs water-use projects whose primary purpose is the reclamation of arid and semiarid lands in the West, markets electric power produced at water resource projects of the Corps of Engineers in the 17 Western States, except for the Pacific Northwest area, and operates several high-voltage transmission systems in the West.*

▲ *Bonneville Power Administration markets power produced at projects of the Corps of Engineers and Bureau of Reclamation in the Pacific Northwest and it also operates an extensive high-voltage transmission system.*

▲ *Southeastern Power Administration and Southwestern Power Administration market power from Corps of Engineers projects in the Southeastern and the central Southwest areas, respectively. The latter operates a high-voltage transmission system. Southeastern markets power at the projects or uses wheeling arrangements.*

▲ *The Office of Saline Water develops low-cost processes for the conversion of salt water to fresh water and constructs and operates facilities to test these processes.*

The following table, prepared on a consolidated basis for fiscal y 1960, summarizes the marketing of hydroelectric power by Depa ment of the Interior agencies.

*Power production and marketing data, fiscal year ended June 30, 1960*

| Marketing agency | Installed capacity, as of June 30, 1960 (kilowatts) | Net energy generated (million kilowatt-hours) | Energy marketed (million kilowatt-hours) | Gross re nue (th sands dollars |
|---|---|---|---|---|
| Bureau of Reclamation | [1] 5, 928, 085 | 27, 418 | [4] 13, 984 | [5] $51 6 |
| Bonneville Power Administration | [2] [3] 3, 781, 000 | 18. 304 | 29, 683 | 70 8 |
| Southeastern Power Administration | [2] 1, 283, 600 | 4, 087 | [6] 4, 048 | 20 1 |
| Southwestern Power Administration | [2] 601, 000 | 1, 672 | [6] 2, 061 | 15 5 |
| Total | 11, 593, 685 | 51, 481 | 49, 776 | 158 |

[1] Includes 745,035 kilowatts in Corps of Engineers, 31,500 kilowatts in International Boundary and W Commission, and 5,151,550 kilowatts in Bureau of Reclamation projects.

[2] Capacity in Corps of Engineers projects.

[3] Bonneville Power Administration also markets power from Bureau of Reclamation's Grand Cou Hungry Horse, Chandler and Roza powerplants with a capacity of 2,252,250 kilowatts.

[4] Excludes 12,857 million kilowatt-hours delivered at Grand Coulee, Hungry Horse, Chandler, and R powerplants by Bureau of Reclamation to Bonneville Power Administration (this amount included Bonneville Power Administration energy marketed).

[5] Excludes $16,978,000 revenue received by Bureau of Reclamation from Bonneville Power Administrat (this amount included in Bonneville Power Administration revenue).

[6] Includes purchased energy.

The Assistant Secretary is responsible for the defense functio with respect to electric power which have been delegated to the Secr tary by the Office of Civil and Defense Mobilization. To carry o this program, a field organization has been established to handle ce tain postattack power problems. Some 40 directors and assistan have been appointed to head the 16 power areas in this organizati and approximately 2,000 power liaison officers to Office of Civil ar Defense Mobilization regional offices and to State and local gover ments have been designated.

Personnel of electric utilities were trained in radiological defens A survey of normal inventories and uses of electric survival iten has been completed, and data with respect to generating plants an substations is nearing completion.

## *Coordination Activities*

The Assistant Secretary served as Departmental representative o the Inter-Agency Committee on Water Resources and on the Presi dent's Advisory Committee on Public Works Planning, State Depart ment Advisory Committee and as chairman, Engineering Group fo

Canadian Columbia River Storage, an international study; participated in interagency conferences on the coordination of watershed, flood-control, and reclamation programs. He conducted conferences in the field and in Washington on power marketing and irrigation development, attended by water and power users, congressional delegations, and representatives of local interests and industry, and testified before congressional committees.

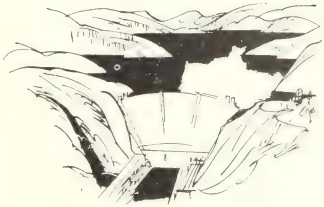
Specialized power studies by the Technical Inter-Agency Power Group for National Defense were made in southern California, the Pacific Northwest and Alaska. Outstanding among these accomplishments was a program for implementing firm power supply through 1963 in the Missouri River Basin, developing a marketing plan in the Colorado storage project service area, and studies for marketing of surplus Pacific Northwest power in the northern California area.

During the year, the office of the Assistant Secretary reviewed 73 reports of the Corps of Engineers, Department of the Army, primarily for flood control and navigation improvements; 35 Federal Power Commission applications for permits and licenses for hydroelectric developments; and 39 Department of Agriculture watershed work plans.

Staff of the Office served as Departmental representatives on interagency committees concerned with radio frequency allocation, procurement of heavy electrical equipment, international water developments, the International St. Croix River Engineering Board, public works planning, financial practices for water and power projects, economic analyses, atomic energy, and national technical society committees.

# *Bureau of Reclamation*

**Floyd E. Dominy,** *Commissioner*



INCREASED WATER SUPPLIES for homes, farms, and industry in the semiarid West, and other major multiple-purpose benefits of regional and national importance were provided by the extensive planning and construction program of the Bureau of Reclamation of the Department of the Interior during fiscal year 1960.

During the year, the Bureau's project development program involved preparation of comprehensive plans for development of river basin resources and investigation and planning of potential projects to meet the requirements of the fast growing population of the West which is dependent on limited water resources.

Under its construction program for the fiscal year, the Bureau continued to develop water and land resources. An investment of about $200 million was added to the Bureau's $3.3 billion plant investment in western projects through completion of dams, powerplants, irrigation canals, pumping plants, electrical transmission lines, and other wealth-creating facilities.

Construction completed during the year added more than 219,000 acre-feet of storage capacity in new Reclamation project reservoirs, 16,000 kilowatts of hydroelectric generating capacity, 159 miles of canals and related water conveyance and distribution structures, and more than 200 miles of high voltage backbone transmission lines.

The 155 Reclamation reservoirs capable of storing 87.7 million acre-feet of water in 1960 provided full or supplemental water supplies not only for the irrigation of arid lands and for generation of hydroelectric power, but also for use by rapidly growing municipalities and expanding industries, and for public recreation, fish and wildlife conservation, as well as storage space for flood control and salinity control.

Four new projects—Little Wood River, Idaho; Solano, Calif.; Santa Maria, Calif.; and Ventura River, Calif.—were in operational status. Another—Michaud Flats, Idaho—was substantially co pleted.

The irrigable area for service on the 83 operating irrigation proje in 1959 totaled 8,094,383 acres, comprising 129,000 farms. The ac age actually irrigated was 6,798,751 acres.

Municipal and industrial water deliveries reached a total of 2 billion gallons, an increase of 13 percent over the previous year. Mo than 200 municipalities and other nonfarm entities, with a populati of 8.1 million persons, benefited from this service. Recreational usa of storage reservoirs and other water areas amounted to an estimat 22.7 million visitor-days, an increase of 16 percent in 1 year.

The 129,000 farms on Reclamation projects in 1959 produced cro valued at more than $1 billion. This 54th harvest, $129 million great than the previous year, was an all-time record and brings the cumul tive value of crops grown on Reclamation projects since 1906 to mo than $15 billion.

The Bureau's activities in planning, developing, and operating Fe eral irrigation projects have been greatly facilitated through cooper tion with other agencies or organizations. The special skills, e perience and equipment of these public agencies have been fully ut lized whenever it was to the advantage of the Government.

Recognizing that the development of water resources in other cou tries is often a prerequsite to economic progress in those countrie the Bureau—at the request of the Department of State—entered in an agreement with the International Cooperation Administration t assist the Government of Afghanistan in bringing its Helmand Valle project to a more satisfactory level of operating efficiency.

The Bureau also continued its established program of investigatio in the Blue Nile River Basin of Ethiopia, and extensive "good neighbor" activities in support of the U.S. Government's technical aid program consisting of providing on-the-job training for foreign enginee and technicians at Bureau facilities. Reclamation specialists also we assigned for short details to various countries on specific problem Funds to cover costs of such programs are provided by the agenc requesting the service.

The Bureau participated in publication of two books of major interest to the West during the fiscal year. They were Design of Smal Dams, a 611-page technical reference book published by the Bureau and Irrigation on Western Farms, written and published jointly b the Bureau and the Soil Conservation Service, Department of Agriculture. A special Bureau report, "Future Needs for Reclamatio in the Western States," was published by the Select Senate Committe on National Water Resources as its Committee Print 14, and attracte widespread attention.

## *Construction Increases Western Water Supply*

More than 400 separate contracts for construction and equipment, materials, and supplies were awarded in fiscal year 1960 with a total value of about $89 million. Of this total amount, construction contracts accounted for about $73 million, or about 85 percent.

A total of 203 construction contracts having a value of more than $49 million were completed during the year. The 160 construction contracts in force at the end of the year had a total value of about $371 million.

In addition to contracts awarded for construction purposes, procurement of miscellaneous equipment, supplies, and services totaled approximately $19 million, for a total procurement program for the year of about $108 million.

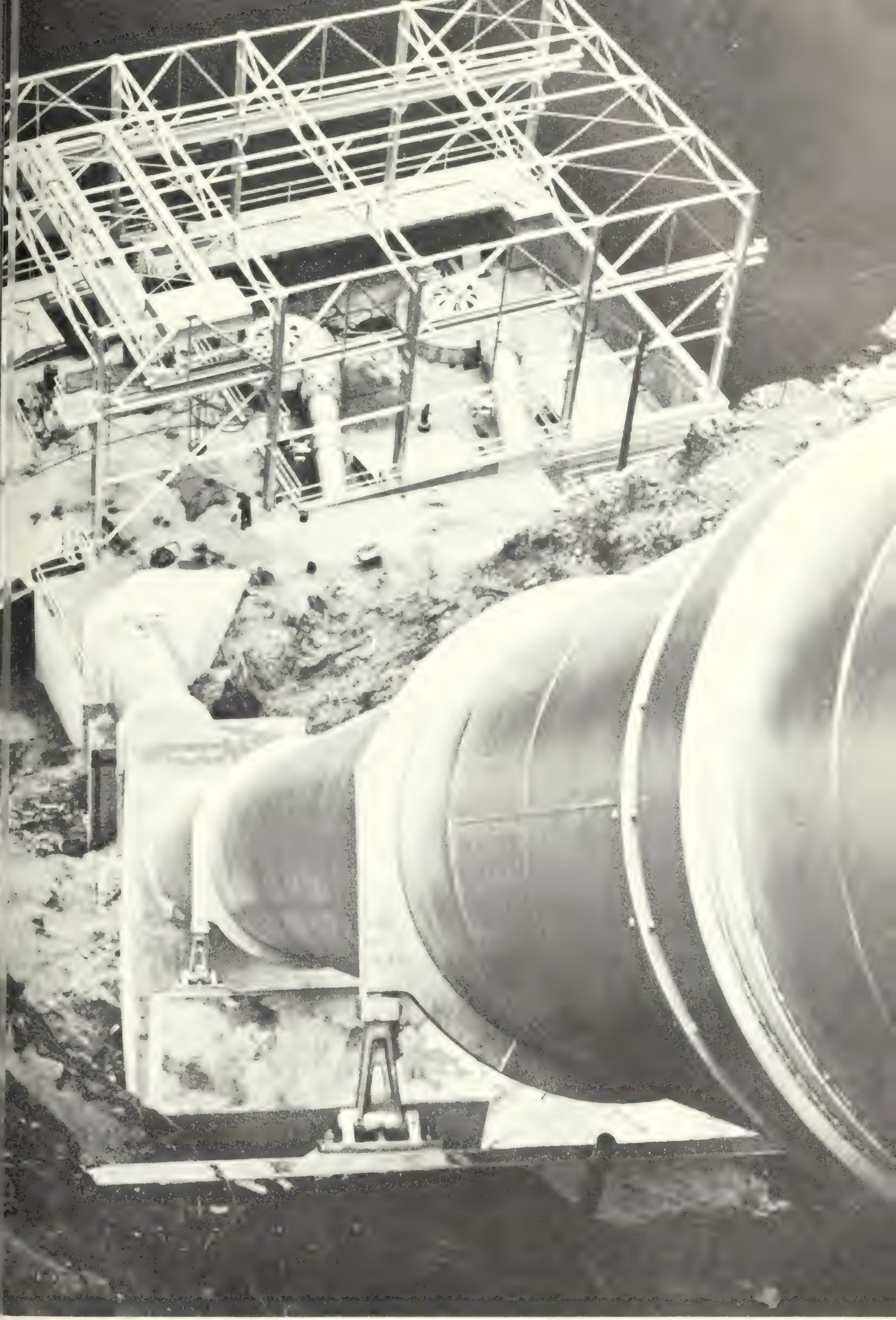
Notable events during the fiscal year included the placing of the first bucket of concrete in Glen Canyon Dam on the Colorado River Storage project in Arizona, and the diversion of the Green River at the Flaming Gorge Dam, also on the Colorado River Storage project, in Utah, thus clearing the damsite for foundation and keyway excavation. More than 24 million cubic yards of the 33-million cubic yard earthfill Trinity Dam, on the Central Valley project in California, were in place by year's end. By the end of the fiscal year, about one-half of the 26-million cubic yard earthfill Navajo Dam, feature of the Colorado River Storage project in New Mexico, had been placed.

Other major events of the fiscal year included the placing in operation of the 16,000-kilowatt Green Springs powerplant on the Rogue River Basin project in Oregon and the completion of Vega Dam on the Collbran project in western Colorado and the Fort Cobb Dam in western Oklahoma.

A highlight of the year was the dedication in October 1959 of the Power System Operations Office Building at Watertown, S. Dak., a eature of the Transmission Division of the Missouri River Basin project. The operations office is the "nerve center" of the entire astern division of the Federal power system in the Missouri River Basin. The office controls the transmission of the power from 5 powerplants over 3,700 miles of transmission lines, through more than 0 Federal substations, to 125 wholesale customers in an area of more han 270,000 square miles in Montana, North and South Dakota, Nebraska, Minnesota, and Iowa.

The year will also be remembered for the celebration of the Golden Jubilee of the Lower Yellowstone project in Montana and North Dakota—50 years of progress on the project since the first water for rrigation was made available in 1909.

*Workmen on the 230-kilovolt bus structure in the substation yard at the Watertown substation, South Dakota.*



*The Helena Valley pumping plant, located about 500 feet downstream from Canyon Ferry dam on the left bank of the Missouri River, is the throbbing pulse that will provide irrigation water for the Helena Valley Unit and the supplemental supply of municipal water for the city of Helena.*

Other important events included the completion of Keene Cr Dam on the Rogue River Basin project in Oregon, the enlargem of the Little Wood River Dam on the Little Wood River project Idaho, and the Southside Tunnel on the Collbran project in Colora

Start of construction on four major earthfill dams was made duri the year—Prosser Creek Dam on the Washoe project, Californ Nevada; Twin Buttes Dam on the San Angelo project in Texas, Gr Reef Dam on the Glendo Unit of the Missouri River Basin project Wyoming, and Sherman Dam on the Farwell Unit of the Misso River Basin project in Nebraska. A major contract was awarded f construction of the Red Willow Dam, an earthfill feature of t Frenchman-Cambridge Division of the Missouri River Basin proj in Nebraska.

## *Columbia River Basin*

Irrigation facilities on the Columbia Basin project in Washingt were completed to serve an additional 25,000 acres, bringing the tot to 411,000 acres. Also completed were the enlargement of two reach of the Potholes East Canal, the Sand Hollow Pumping Plant for t Royal Branch Canal lateral system in Block 83, the Royal Bran Canal lateral system in Block 82, the second section of the Wahlu Branch Canal, the Block 201 lateral system, and the White Blu Pumping Plant No. 2.

In Oregon, in addition to completion of the 16,000-kilowatt Gre Springs Powerplant, construction progress was noted by completi of the earthfill Keene Creek Dam, Green Springs Power Conduit, a the Ashland Lateral and Phoenix Canal Diversion Dams. Also co pleted on the project were the second section of the Howard Prair Delivery Canal, the Green Springs and Cascade Divide Tunnels, a a part of the South Fork Collection Canal system. Another secti of the South Fork Collection Canal system was about two-thirds co pleted. Enlargement of Emigrant Dam was about two-thirds co pleted by the end of June 1960.

Construction of the earthfill Wasco Dam on the Wapinitia proje in Oregon was completed. Construction of the earthfill Prinevil Dam on the Crooked River project was virtually completed by t end of the fiscal year. Also completed was the enlargement of t Little Wood River Dam, an earthfill structure on the Little Woo River project in Idaho.

## *Central Valley of California, Lahontan Basin, and Coastal Are*

More than 24 million cubic yards of the 33-million cubic-yard e bankment for Trinity Dam were placed. The dam, the world's high st earthfill dam, on the Trinity River Division of the Central Valley project in California, is to be 537 feet high. The contract for construction of the dam was 87 percent completed, well ahead of schedule, by year's end. Clearing of 9,800 acres of the reservoir was essentially completed, and clearing of another 5,600 acres was about 50 percent completed. The contract for excavation and concrete lining of the 0.8-mile, 17.5-foot-diameter Clear Creek Tunnel, was about 78 percent completed at the end of June 1960, in 70 percent of the contract time. On June 30, less than 1,000 feet separated the headings in the tunnel, second largest tunnel on a Reclamation project; hole-through was achieved early in August 1960.

Other construction on the Central Valley project included construction of pumping plants and pipeline lateral system for the Tea Pot Dome Water District of the Friant-Kern Canal distribution system, which was started in January 1960, and was about 35 percent completed by the end of the fiscal year. Construction of the Corning Canal Pumping Plant was about 80 percent completed. Installation of new armature windings for two generating units of the Shasta Powerplant was completed in April 1960, and the units were returned to service.

Also on the Central Valley project, near the end of the fiscal year, contracts were awarded for the 2½-mile-long Spring Creek Tunnel and siphon and for Trinity and Clear Creek powerplants. Initial power generation is scheduled for February 1963. Specifications for Whiskeytown Dam were issued.

Solano and Ventura River projects are virtually complete and both have been transferred to operation and maintenance status. A part of the Solano project and all of Ventura River project are being operated by the water users.

Construction of the San Luis unit as an integral part of the Central Valley project was authorized by Public Law 86–488. This addition will ultimately serve an additional 458,460 acres with irrigation water. A joint-use agreement with respect to construction and operation is being developed with the State of California.

A new start of the fiscal year was the beginning of construction of the Prosser Creek Dam on the Washoe project, near the California-Nevada State line. The earthfill dam will be 157 feet high and have a volume of 1,738,600 cubic yards.

### *Lower Colorado River Basin*

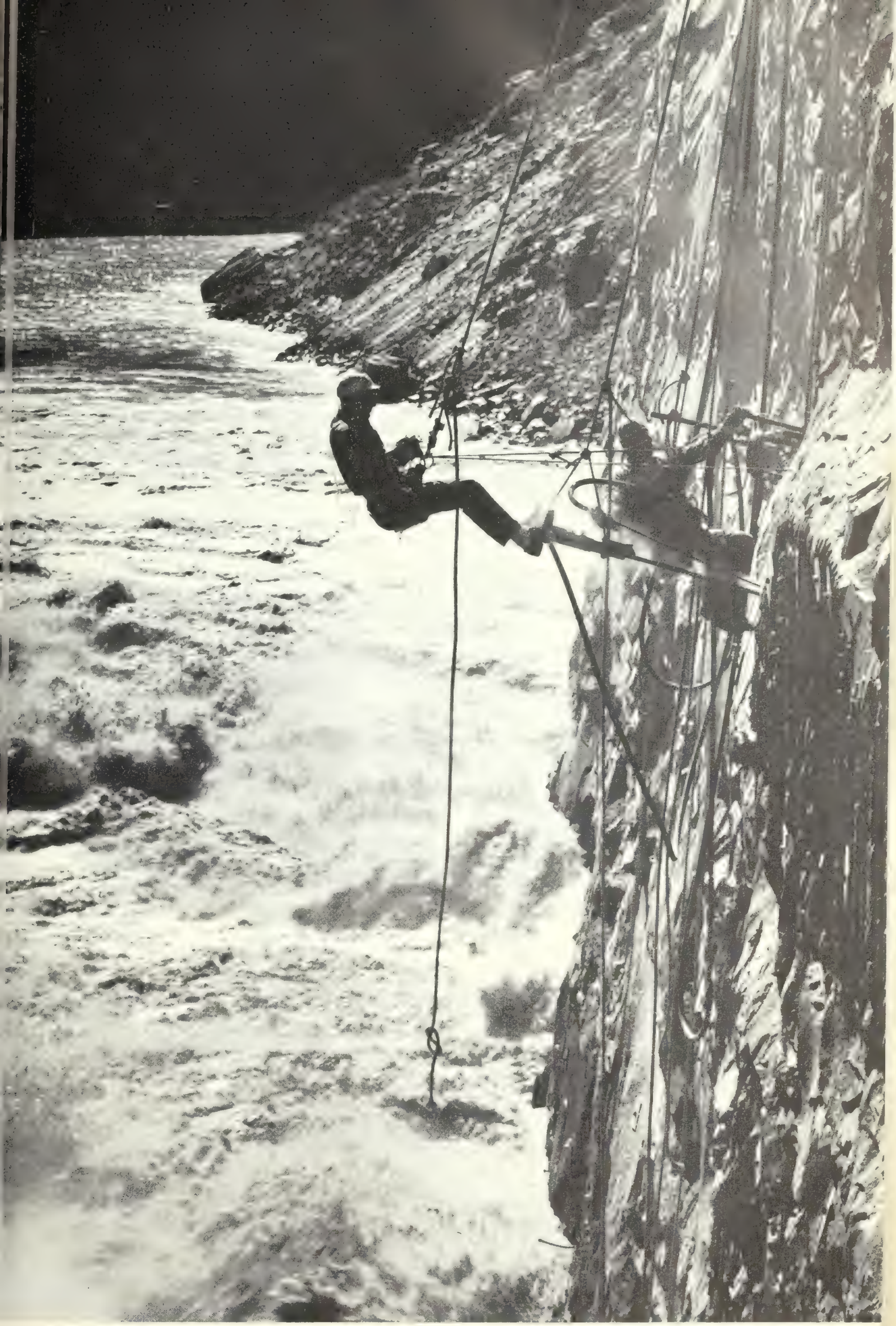
Hoover Dam passed its 25th anniversary. Authorized on December 21, 1928, and completed on May 29, 1935, when the last concrete was placed, this pioneer reclamation multipurpose river control project has captured and stored about 300 million acre-feet of Colorado

*Cantaloupes grown on the Yuma Project—oldest Reclamation development on th lower Colorado River—are a favorite delicacy on dinner tables throughout th Nation, and project farmers in 1959 produced cantaloupes on nearly 13,000 acr of land valued at over $6 million.*

River flood waters. This storage has irrigated up to three-fourth million acres of farmland in California and Arizona each year—producing a cumulative crop value of $2.25 billion. Since the first generator went on the line in 1936, Hoover hydroelectric units have delivered 98 billion kilowatt-hours of energy with a gross revenue o $182.5 million.

Installation of the 17th and final generating unit—N–8—for th State of Nevada in the Hoover powerplant got underway followin earlier awarding of major contracts for its manufacture. Rated a 95,000 kilowatts and raising the Hoover powerplant's rated capacit to 1,344,800 kilowatts, N–8 is scheduled to go on the line in the Fal of 1961—approximately 25 years after the first Hoover generato began operation.

The total fiscal year 1960 output by Hoover, Davis, and Parke Dams on the Lower Colorado River of 5.25 billion kilowatt-hours represented 12⅔ percent of all electrical energy consumed in the Pacific Southwest.



*lighscalers drill on the canyon wall just above the rushing water as it pours from he right diversion tunnel.*

*Aerial view looking downstream at Glen Canyon Damsite as excavation work h been almost completed. The upstream cofferdam is 160 feet high.*

Reclamation's hydraulic cutter dredge completed a 19.2-mile stret of new channel on the Colorado River between Needles, Calif., an Big Bend, below Davis Dam. The dredge cut about 5 miles of ne channel and removed about 5.25 million cubic yards of riverbed m terial during the year. Some 31.5 miles of new channel have bee completed in the Needles stretch of the river since the dredge bega operations there early in 1949.

Sheep Creek barrier dam in the Paria River basin was complete The structure will reduce silt inflow to the Colorado River belo Glen Canyon Dam.

Major contracts were awarded for 61⅔ miles of main conveyan channel and the 10-mile Snyder Ranch conveyance channel on th Wellton-Mohawk division of the Gila project, Arizona. This work part of the drainage program for the Wellton-Mohawk Irrigatio and Drainage District under a $14-million amendatory repaymer contract, which is the largest single drainage contract in reclamation history.

*cretary of the Interior Fred A. Seaton pulls the lanyard tripping the bucket and leasing the first 12 yards of concrete onto the floor of Glen Canyon.*

Rehabilitation and betterment work on the Salt River project in ntral Arizona continued at the rate of $1 million per year. The ureau has contracted with the Salt River Valley Water Users' ssociation for $16 million of this work. Approximately $9.5 million as been expended as of June 30, 1960.

The city of Yuma, Ariz., was assured an annual water supply from ie Colorado River of 50,000 acre-feet under a contract executed with ie Department of the Interior.

### *pper Colorado River and Bonneville Basins*

A major highlight of the year was the placement on June 17, 1960, f the first bucket of concrete in the Glen Canyon Dam, principal ature of the Colorado River storage project on the Colorado River northern Arizona. Although the 6-months' strike from June 6 to

December 22, 1959, halted all construction at Glen Canyon dams the prime contractor was able to complete keyway and foundat excavation and construction of the aggregate, refrigeration, and ba plants so that regular concrete placement could begin in June 196

When completed, the 710-foot high concrete arch structure will h a volume of about 5 million cubic yards. Work under the contract the dam and the 900,000-kilowatt Glen Canyon powerplant was ab 35 percent completed.

Construction of the storage project's 490-foot high concrete a Flaming Gorge Dam on the Green River in northeastern Utah, about 30 percent completed by the end of the fiscal year. The flow the Green River at the damsite was diverted through the divers tunnel in November 1959, thus clearing the damsite for foundat and keyway excavation. By June 1960, foundation excavation the river channel neared completion. The contractor continued er tion of his concrete batch plant, aggregate plant, and overhead cak ways for start of concrete placement in fiscal year 1961.

Construction of the earthfill Stanaker Dam on the Central Ut project, a participating project of the Colorado River storage proj in Utah, was about 50 percent completed. All concrete work w essentially completed and approximately half of the 1,945,000-cub yard embankment was in place. On the Weber Basin project, also Utah, construction of 3 trunklines and 4 pumping plants to distrib water from the Davis Aqueduct was completed, as was also constru tion of the Bountiful Subdistrict Lateral System. The Ricks Cre Lateral System and part 1 of the Woods Cross lateral system we virtually completed. Construction of the first stage of the earth Willard Dam was completed, and work on the second stage was abo one-third completed.

In western Colorado, on the Collbran project, the 150-foot hig 926,000-cubic-yard earthfill Vega Dam was completed. Also co pleted was the half-mile long Southside Tunnel. Construction the first 21-mile section of the Southside Canal and the remaini 11.6-mile section of the canal was about 30 percent completed. Co struction continued on the 8,640-kilowatt Upper Molina powerpla and on the 4,860-kilowatt Lower Molina powerplant, as well as the 5.6-mile long Bonham pipeline and the 5.5-mile long Cottonwo pipeline. Late in the fiscal year, construction began on the Leon ar Park Creek Feeder Canal System.

At Paonia Dam, on the Paonia project, also in western Colorad work during the year proceeded on the completion of the highwa relocation, excavation for the spillway, placing concrete lining i the outlet works tunnel, and construction of the stilling basin prepa atory to diverting Muddy Creek. The flow of Muddy Creek wa verted through the completed tunnel and stilling basin during May 1960. Following diversion, excavation for the dam foundation was completed. Placement of the 210-foot high, 1,266,000-cubic yard earthfill embankment was scheduled to begin early in fiscal year 1961.

At Navajo Dam in northwestern New Mexico, the flow of the San Juan River was diverted through the outlet works in January 1960. By the end of the fiscal year, approximately one-half of the 26-million cubic yard earthfill embankment had been placed. The entire work on construction of the 408-foot-high dam, principal feature of the Navajo unit of the Colorado River storage project, was approximately 60 percent completed in 42 percent of the contract time.

The first construction contract on the Hammond project (New Mexico) was awarded in June 1960. The start of actual construction on the Seedskadee project (Wyoming) was delayed by the problems associated with the discovery of valuable trona deposits underlying a large portion of the project area.

Construction of the Eden project (Wyoming) was completed. On the Weber Basin project (Utah), the second phase of Willard Dam was started, and work was continued and/or completed on a number of lateral systems to distribute water from the Davis and Weber aqueducts. Particularly significant was the payment of the first construction installment of $198,873 on the Weber Basin project under the terms of the repayment contract with the Weber Basin Water Conservancy District.

### *Rio Grande and Arkansas River Basins*

The most significant construction activity was the award of the prime contract for Twin Buttes Dam and the beginning of construction of the San Angelo project. The principal use of the 134-foot-high, earthfill dam and reservoir will be for a municipal and industrial water supply for the city of San Angelo, Tex. Ground-breaking ceremonies were held at the damsite on June 22.

Fort Cobb Dam on the Washita Basin project, Okla., was completed and the aqueduct system for municipal and industrial water for several Oklahoma cities was nearing completion. Construction of the Foss Dam, a 10,567,000-cubic-yard earthfill dam, was ahead of schedule and contract was awarded for construction of a 50-mile aqueduct system for municipal and industrial water supplies for several Oklahoma cities.

Planned recreational facilities around Fort Cobb dam and reservoir were practically completed.

Rehabilitation of existing irrigation and drainage work was begun on one of the Bureau's oldest projects—Rio Grande project,

*Enough hydroelectric energy to supply five cities the size of Minneapolis, Min routed over 3,700 miles of transmission line for distribution over a 270,0 square mile area—that is the weekly, daily, hourly job of the dispatchers pictur at the console of the instrument board in the main system dispatchers office, Wat town, S. Dak.*

Texas-New Mexico—and continued satisfactorily on several divisio of the Lower Rio Grande project, Tex.

A joint program with the Corps of Engineers and the Bureau Reclamation for channelizing of the Rio Grande above the Elepha Butte Reservoir continued during the year. This work involv straightening the channel, providing floodways, and placement protective features, all of which are designed to improve control of t river, protect irrigation project features and lands through whic the river flows.

Construction of the Norman project, Okla., was authorized by Public Law 86–529. This project when constructed will provide neede domestic water for three Oklahoma communities and an importa air base and will contribute substantial flood control and fish and wildlife benefits.

## *Missouri River Basin*

In Wyoming, construction of the structure for the 48,000-kilowat Fremont Canyon powerplant was completed, and lining of the 3-mil

*erial view of the Kirwin Development Farm. The Kirwin Main Canal is at left nd the farmstead at upper right.*

ong, 18-foot diameter power conduit was completed. Also in Wyoming, more than 60,000 cubic yards of the concrete was placed in the 03-foot high, 66,000-cubic yard Anchor Dam, Owl Creek unit, Missouri River Basin project. By the end of June 1960, the concrete was nly about 17 feet below the final crest height. All mass concrete is xpected to be in place early in fiscal year 1961.

On the Glendo unit of the Missouri River basin project, construction f Gray Reef Dam was started. This will be an earthfill structure on he North Platte River, and will be 36 feet high and have a volume f 49,000 cubic yards.

A new irrigation start was the 50,000-acre East Bench unit in Iontana. Laterals, drains, and canal lining on the Helena Valley nit, and rehabilitation of Sherburne Lake Dam of the Milk River roject, Mont.; modification of the outlet works for Shadehill Dam, n the Grand River, S. Dak.; and construction of the left abutment utlet works and rehabilitation of the penstock intakes, Buffalo Bill Dam, Shoshone project, Wyo., were also among the major construction ctivities during the fiscal year.

Another new start was Sherman Dam on the Farwell unit o he Missouri River basin project in Nebraska. The earthfill dam ill be 97 feet high and have a volume of 1,700,000 cubic yards. A ut 300,000 cubic yards of embankment was placed by the end of the f al year.

On the Frenchman-Cambridge division of the Missouri River b in project in Nebraska, reconstruction of the old Culbertson Canal as continued; reconstruction of the last section of the old canal as about 90 percent completed when work was halted until after he close of the 1960 irrigation season. Construction of the new Culb tson Extension Canal under two contracts was in progress during he year.

Work on the Bostwick division of the basin project in Kansas as noted by the completion of the 5.5-mile-long White Rock Ca l. Work was started on the 8.6-mile-long White Rock Extension C al and 6.9 miles of laterals. Also in Kansas, on the Kirwin unit, he 13.9-mile-long third section of the Osborne Canal and 17 miles of laterals were completed, and work was started on the 10.5-mile-l g fourth section of the canal and 12.8 miles of laterals and drains.

## *Safety in Heavy Construction*

The Bureau continued to maintain its safety program for the p e-vention of accidents associated with the hazards of heavy constr c-tion work. Efforts were directed toward prevention of injuries and l s of life by eliminating the physical and personal causes of accide . The overall accident frequency rate was 10 percent below the natio l average for heavy construction, despite the fact that hazardous tun l work on Reclamation projects accounted for 11 percent of the to l man-hours worked.

## *Bidding Is World-Wide*

Competition from European manufacturers under invitations equipment issued by the Bureau of Reclamation increased over th of the past 2 years. Twenty-three contracts were awarded to co panies offering foreign-manufactured equipment, including 9 Itali 4 West German, 4 Swiss, 3 Austrian, 2 English, and 1 French. Si teen of these contracts were for electrical equipment. The remaini seven contracts were for gates, valves, pumping units, a crane, and hoist, indicating increasing interest in such equipment by forei manufacturers.

*the farmlands develop on the project, a great many processing plants are built handle the produce from irrigated lands. These peas have just been shelled d will be packaged and frozen.*

The following tabulation shows a comparison of contracts awarded r foreign equipment during the past 5 fiscal years.

| Fiscal year | Total contracts | Total value |
|---|---|---|
| 1956 | 41 | $2,256,057 |
| 1957 | 26 | 1,387,693 |
| 1958 | 21 | 965,867 |
| 1959 | 18 | 899,076 |
| 1960 | 23 | 2,234,972 |

Bids were received for the first time from companies offering equip- ent manufactured in Japan. Bids were received from Japanese anufacturers for the Glen Canyon, Flaming Gorge, and Trinity owerplant turbines. The contract for channelization of the Rio

*Citrus, a Reclamation health food crop. Nearly 300,000 acres of reclamati project lands are utilized for production of apples, peaches, grapes, citrus a other fruits. Citrus acreage has tripled in 30 years.*

Grande, Belen Area unit 2, Middle Rio Grande project, N. Mex., w awarded on the basis that foreign steel would be used in the jett units. In accordance with regulations, a differential was added t foreign bids for comparison with domestic bids.

## *Construction Costs Decline*

Construction costs on Bureau of Reclamation projects decrease about 2 percent during fiscal year 1960. For the same period, con struction wage rates increased about 5 percent, while most construc tion material costs remained fairly stable.

Bidding interest in reclamation construction work remained high an average of 7.4 bids was received on each construction schedule ad vertised. The average low bid was 16 percent below the engineers estimate.

Table 1 of the appendix lists major construction and supply con tracts (more than $1,00,000 each) awarded by the Bureau of Reclama tion in fiscal year 1960.

*est's livestock winters and fattens in irrigated stream valleys. More than 70*
*rcent of reclamation project lands are utilized for grain and forage for livestock*
*erations.*

Principal features completed on Bureau of Reclamation projects in
iscal year 1960 are shown in table 2 of the appendix. The list in-
udes 5 storage dams, 2 diversion dams and 159 miles of canals, pipe-
nes, laterals, and drains, as well as 202 miles of transmission lines.

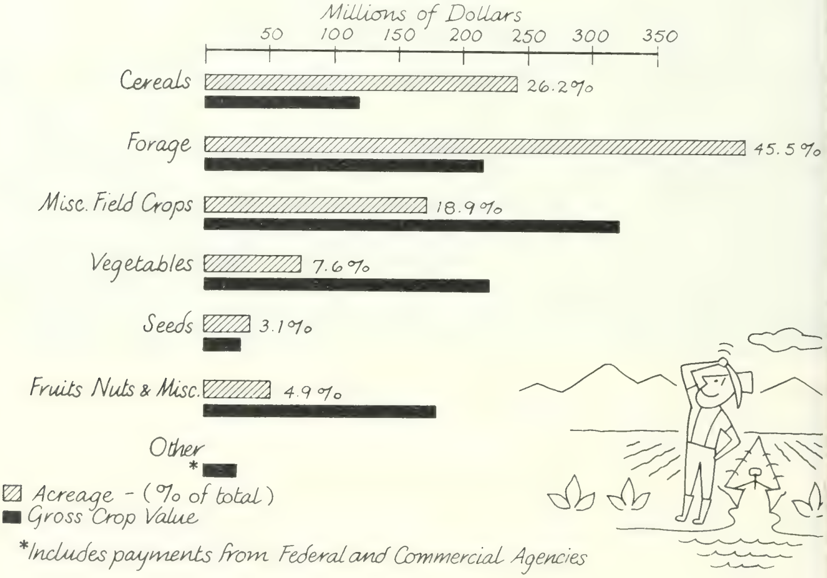
## *Dependable Water Means Diversified Crops*

The value of all crops on all Bureau of Reclamation projects aver-
ged $164 per acre in 1959. The highest project average was $819.
elery topped all crops with an average per-acre value of $1,928.
etails of this agricultural production are provided in tables 3 and 4.

The utilization of over 70 percent of the irrigated lands for the
roduction of 18.4 million tons of forage and grain is indicative of
e importance of livestock operations on reclamation farms.

Favorable trends are evident in the productivity and utilization
the reclamation areas. Crop yields progressively push ahead.
tensification is evident in increasing proportions of vegetables and
uit acreages.

Reclamation complements the Nation's agricultural plant in ducing the fruits, vegetables, livestock, and livestock produc the protective, body-building foods rich in protein, vitamin A the three B vitamins, needed for adequate diets of many of people. Nearly 10 billion pounds of vegetable crops were prod by reclamation farmers in 1959. Vegetable cropping used onl percent of the irrigated land but produced one-fifth of the c value. Much of this production is for the fresh vegetable marke late fall, winter, and early spring when only limited produc is available from nonirrigated areas. The market value of tl crops does not fully represent their true value in terms of benefit balanced and attractive year-round diets.



*Includes payments from Federal and Commercial Agencies

## *Converting Water Into Power*

In order to utilize to the greatest advantage the water suppl made available by multipurpose reservoirs, the Bureau of Reclan tion in its program of aiding in the developing of America's wa resources has constructed and, as of June 30, 1960, is operating powerplants with an installed nameplate capacity of 5,151,550 ki watts. In addition, the Bureau is responsible for marketing t power generated at four powerplants constructed by the Corps Engineers with a total installed nameplate capacity of 745,035 ki watts and one powerplant installed by the International Bounda and Water Commission, with a total nameplate capacity of 31,5 kilowatts.

Sale of electric power by the Bureau during the year aggregated
840,676,301 kilowatt-hours, with revenues from sales totaling
3,754,385.

During the fiscal year ending June 30, 1960, the installed name-
ite capacity of hydroelectric powerplants at Bureau of Reclama-
n multipurpose projects and at projects for which the Bureau is
sponsible for marketing the power was increased 16,000 kilowatts.
so the Old Eklutna hydroelectric powerplant in Alaska with a
meplate capacity of 2,000 kilowatts was sold during this period.
iis resulted in a net increase of 14,000 kilowatts in installed name-
ate capacity over the fiscal year 1959 figures.

## *lditional Power on Way*

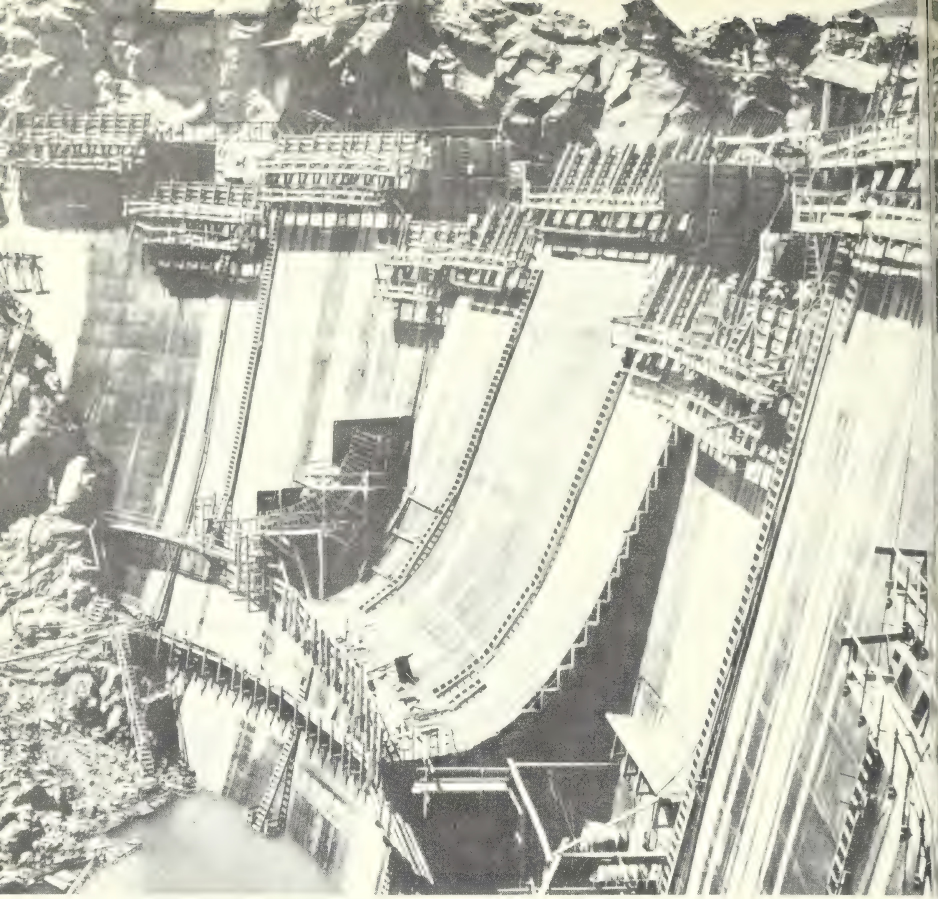
At the end of fiscal year 1960, the Bureau of Reclamation had un-
r construction 8 powerplants, which will have an ultimate installed
meplate capacity of 1,453,500 kilowatts. They are listed below:

| Plant | Project | River | State | Nameplate capacity (KW) |
|---|---|---|---|---|
| r Creek | Central Valley | Trinity | California | 134,000 |
| ng Creek | do | do | do | 150,000 |
| ity | do | do | do | 100,000 |
| er Molina | Collbran | Colorado | Colorado | 8,640 |
| er Molina | do | do | do | 4,860 |
| Canyon | Colorado River storage | do | Arizona | 900,000 |
| ning Gorge | do | Green | Utah | 108,000 |
| mont Canyon | Missouri River Basin | North Platte | Wyoming | 48,000 |

The United States Army Corps of Engineers is proceeding with the
nstruction of its Big Bend and Oahe plants in the Missouri River
sin project. The ultimate installed nameplate capacity of the Big
nd and Oahe powerplants in South Dakota will be 468,000 kilowatts
d 595,000 kilowatts, respectively. The Corps is also installing 2
ditional generating units each in its Fort Peck and Garrison power-
ants, thereby increasing the capacities of these plants by 80,000
lowatts and 160,000 kilowatts, respectively. The Bureau of Recla-
ation will be the marketing agent for energy generated from these
ants as in the case for other plants constructed by the Corps on the
issouri River basin project.

## *ransmission System*

To provide the electrical energy for the Bureau's projects and to
arket the power which is surplus to the Bureau's needs, a trans-
ission system including powerplant substations, switchyards, and
ansmission lines, has been constructed. During the fiscal year end-



*New storage dam for Wyoming's Bighorn basin. Concrete emplacement g s*
*forward on downstream face of Anchor Dam, a 208-foot-high, thin arch struct*

ing June 30, 1960, approximately 202 circuit miles of transmiss
lines were completed resulting in a total system of 10,151 circuit mi
of line. As of June 30, 1960, the installed transformer capacity of
individual substations operated by the Bureau was 11,535,218 kva

Important progress was made on the backbone transmission syst
for the Colorado River storage project. Extensive discussions w
both the private power utilities and the preference power-user grou
regarding plans for transmission lines to interconnect the stora
unit dams and to serve the anticipated market area, culminated
the announcement of the proposed Colorado River storage proj
power marketing area and criteria by the Secretary of the Inter
on May 18, 1960.

Erection of steel towers for the 105-mile-long steel tower F
Peck-Dawson County section of the 310-mile-long, 230-kilovolt tra
mission line, which extends from Fort Peck powerplant in Monta
to Bismarck, N. Dak., was completed. Construction of footings a
erection of steel towers for the 205-mile-long Dawson County-B
marck section were essentially completed by June 1960. Stringing

nductors and overhead ground wire for the 310-mile line was to gin early in fiscal year 1961. The line, which includes both the rt Peck project and the transmission division of the Missouri River sin project, is expected to be ready for service in January 1961. so completed was the 165-mile, 230-kilovolt steel tower transmission e between Fargo, N. Dak., and Granite Falls, Minn. In Wyoming, e 37-mile-long, 115-kilovolt Boysen-Pilot Butte transmission line was mpleted. Under construction during the year was the 100-mile-long, 0-kilovolt Bismarck-Jamestown transmission line No. 2 and the -mile-long, 230-kilovolt Jamestown-Fargo transmission line No. 2, th in North Dakota. In Wyoming, construction of the 140-mile-g, 115-kilovolt Kortes-Cheyenne transmission line was about 75 rcent completed.

## *le of Power*

During fiscal year 1960 there were 144 contracts executed for the le of power, for transmission service or for other purposes.

Included in these 144 contracts were various types as follows:

| *mber of Contracts:* | *Types of Customer* |
|---|---|
| 32 | Private utilities |
| 43 | REA cooperatives |
| 37 | Municipalities |
| 8 | Federal agencies |
| 10 | State agencies |
| 7 | Irrigation districts |
| 7 | Miscellaneous type contracts |

A number of the contracts executed were renewals of operating ntracts or revisions of existing contracts resulting from a change operating conditions.

The Bureau continued its policy of contracting whenever possible ith private utilities, public bodies and cooperatives for wheeling ower and energy over existing facilities. The Bureau also entered to several interchange agreements with its customers.

The Bureau at the end of fiscal year 1960 had 43 contracts under tive negotiation. In this number are included 12 contracts with ivate utilities, 11 with REA cooperatives, 11 with municipalities, with Federal agencies, 5 with State agencies, and 1 with an irriga-on district. A number of these are to renew the existing contracts to revise contracts in existence due to changes in operating condi-ons.

The recently approved allocations for the Central Valley project d the eastern division of the Missouri River basin project will re-ire the preparation of new contracts or supplements to existing ntracts with the allottees.

*Missouri River basin project—Kansas. Aerial view of the Kansas-Bostwick I i-gation Development Farm.*

## *A Forward Look at Water Project Development*

During the year the Bureau, in cooperation with other agencies, v s engaged in comprehensive surveys in 14 river basins throughout t e West, including three subbasins of the Missouri River basin. Misc - laneous general studies were essentially completed in several of th e basins and subbasins such as the Kootenai River basin in Monta , the Lower Klamath River and adjacent basins in California a Oregon, and the Pecos River basin in New Mexico and Texas. Stud s were also essentially completed on the Bighorn basin division in Wy ming and the South Platte River basin in Colorado, Wyoming a Nebraska—subbasins of the Missouri River basin.

### *Project Planning Reports*

By the end of the year project planning reports had been submitt to Congress on the Mann Creek project in Idaho; the San Jua Chama project in New Mexico and Colorado; the western division he Dalles project in Oregon; the Garrison diversion unit, Missouri ver basin project in North Dakota; the Pine River project exten- on in Colorado; and Ruedi dam and reservoir, Fryingpan-Arkansas oject in Colorado.

Planning reports on Agate dam and reservoir, Rouge River basin oject, Oreg., and Savery-Pot Hook project, Colo. and Wyo., were ansmitted to States and Federal agencies, and were under review at e end of the fiscal year, prior to submission to the Bureau of the udget.

In addition, the planning report on the Oroville-Tonasket unit, ief Joseph Dam project, Wash., was transmitted to and was under view at the end of the year by the Bureau of the Budget, to deter- ine its position in relation to the President's program prior to sub- ission to the Congress.

During the fiscal year definite plans for authorized projects were mpleted on the Florida project, Colo., a participating project of the olorado River storage project; the Greater Wenatchee division of e Chief Joseph Dam project, Wash.; and the Kanopolis unit, Mis- uri River basin project, Kans.

The Central Utah Projects Office was established at Provo, Utah, handle the accelerated planning program for the Central Utah oject—the largest participating project of the Colorado River Stor- ge project.

Review has been completed by interested Federal agencies and laska on the planning report for the Crater-Long Lakes division of e Snettisham project.

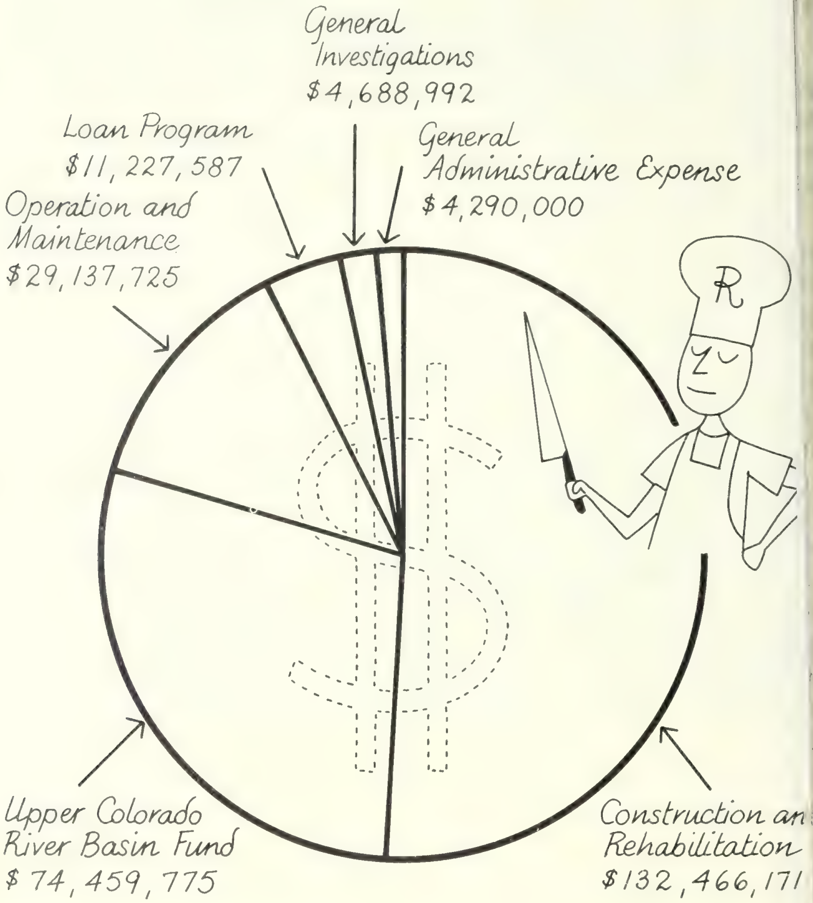
## *iver Compacts*

When called upon, the Bureau has continued to provide technical sistance with respect to negotiations on the following unperfected ter-State compacts:

Arkansas River (Arkansas and Oklahoma).
Arkansas River (Kansas and Oklahoma).
Cheyenne River (Wyoming and South Dakota).
Columbia River (Idaho-Montana-Nevada-Oregon-Utah-Washington-Wyoming).
Little Missouri River (Wyoming-Montana-North Dakota).
Niobrara River (Wyoming-South Dakota-Nebraska).
Red River (Arkansas-Louisiana-Oklahoma-Texas).
Truckee-Carson-Walker Rivers and Lake Tahoe (California-Nevada).

## *ternational Streams Investigations*

The Bureau of Reclamation is represented on two International ngineering Boards of the International Joint Commission. Under



the reference of January 12, 1948, the Souris-Red Rivers Engineer Board through interested Federal agencies continued the systema collection and study of hydrologic data and related flood control a irrigation investigations in the Souris, Red, and Missouri River basi

## *Financing Western Water Projects*

Appropriations made available to the Bureau of Reclamation fiscal year 1960, exclusive of permanent appropriations, totaled $25 271,250. This amount includes $5,903,000 appropriated in two supp mental appropriation acts. Appropriations for 1960 were $9,543,2 less than was made available for fiscal year 1959. This reduction w due primarily to the substantial completion in 1959 of the Ventu and Solano projects.

## *ater Users Repay*

Contracts for repayment of an appropriate share of the reimburs- e costs of a reclamation project are normally prerequisite to the tiation of construction. During fiscal year 1960, more than 40 con- cts were executed for repayment, under reclamation law, of Federal ts associated with water resource projects.

The repayment contracts for the Black Butte and New Hogan proj- s in California achieved two significant firsts. The contracts, ecuted March 2, 1960, were the first to be negotiated by the Depart- nt of the Interior for repayment, under reclamation law, of irriga- n costs of a project to be constructed and operated by the Corps f Engineers. They were negotiated at the request of the Department f the Army following an opinion by the Attorney General that Fed- l reclamation law applied.

The New Hogan and Black Butte contracts are also unusual in that State of California has assumed the responsibility for the repay- nt of reimbursable project costs.

This unique Federal-State contract arrangement is without prece- nt and was possible because the State legislature had previously propriated $13,740,000 for these purposes. The State serves as a arantor while the United States is negotiating contracts with water er organizations. As these contracts are negotiated, the State's ligation will be correspondingly reduced. Beginning with the ghth full calendar year after a project is available for the storage or livery of water, the State has the right to market the remaining oject water supplies. The cost of the Black Butte project is esti- ted at $18 million, of which 39.9 percent is assigned to irrigation. w Hogan project is estimated to cost $17,600,000, with 36.2 percent signed to irrigation.

The total value of all repayment contracts on June 30, 1960, ounted to $954,674,498. Of this amount, a total of $147,926,002 has en repaid and delinquencies were insignificant. In addition, over 25 million will be returned to the Government in water service yments under contracts now in force.

## *nall Loans Assist Local Development*

There was considerable contract activity in the loan programs dur- g the fiscal year.

Congress appropriated $4,062,575 for the first year requirements on e projects under the Small Reclamation Projects Act of 1956 hav- g loans totaling $11,045,000. Construction was initiated on four of ese during the year and on one that received funds in the previous year. Seven other small project applications were approved and f warded to the Congress. One more was approved by the Secret but had not yet been forwarded to Congress by June 30. These l eight approved applications represent loans totaling $25,569,0 Good progress is being made by the four local organizations t started construction in fiscal year 1959 and two of the projects nearing completion. At the end of the year all applications recei had been acted upon within the Department.

Congress appropriated $7,017,000 for two distribution system lo under Public Law 130, 83d Congress. Both local organizati started construction activities before the end of the year. One of two distribution systems started earlier was completed and fairly g progress is being made on construction of the other.

## *Conservation Requires Teamwork*

Cooperative work is implemented by means of agreements betwe the Bureau and the other organizations involved in conservation whi now include several agencies within the Department of Agricultu and the State colleges and extension services of the 17 western Stat and the State of Alaska, as well as many other Federal, State, a local organizations.

During fiscal year 1960 there were 346 such cooperative agreemen in effect. They include studies and investigations conducted on d velopment farms, conservation, and efficient use of soil and wate crop and cropping problems, assistance to county agricultural agent and weed-control studies. They cover also the development and ma agement of reservoir recreational and wildlife areas, and assistan in solving many other problems pertaining to the development a operation of irrigation projects.

Cooperative work also included participation by Bureau represent tives on the Interdepartmental Committee on Pest Control, and on t special work group to develop interagency coordination of plans f emergency water resource management for civil defense and defen mobilization.

### *Soil and Moisture Conservation*

One of the principal functions of the Bureau of Reclamation is th efficient application of water to land without waste or erosion. Th Bureau encourages agricultural agencies and cooperates with them i research and conducts research directed toward water-saving method of irrigation, evaporation control, transpiration losses, and seepag control including canal linings.

The Bureau is interested also in soil and moisture conservation on e lands under its jurisdiction such as those surrounding reservoirs or er areas withdrawn or acquired for reclamation purposes.

These operations are directed toward the protection of reclamation-ilt structures and works from the adverse effects of soil erosion. e work undertaken includes reseeding watershed areas, structural stallations, and other means of erosion control stabilization; vege-tion control and pest control measures; sand dune control; and stallations for the protection of irrigation facilities.

The program objectives are accomplished in cooperation with other deral agencies, as well as State and local agencies. Water users' ganizations also assist in planning the work and in many cases fur-sh a part of the labor, materials, and funds.

## *Water and Science Benefit Settlers*

Development farms have proved to be an important part of the set-ement program on new areas being developed for irrigation. The ureau's field scale demonstrations and the research conducted by operating agricultural agencies on these farms furnish much val-ble information for the use of the new settlers, and remove many the factors which caused hardships and often failures of settlers earlier developed projects. They also aid in the conservation of il and water through promoting more efficient use of these impor-nt natural resources. This phase of conservation is especially im-rtant in view of our increasing population and the decreasing areas itable for irrigation development.

Development farms are established as far as possible in advance settlement, usually 2 to 5 years, in order that much of the necessary perience and information will have been obtained when the new ttlers arrive. The farms are located in areas which best represent e soils and other conditions of the new project. The sites are osen and the plans for the development and operation of each farm e formulated in cooperation with agricultural and other interested encies.

The major portion of each farm is devoted to field scale demonstra-ons of approved farm irrigation systems, irrigation methods, kinds d varieties of adapted crops, cultural practices, weed control, farm ainage, and solutions to other problems with which new irrigation rmers are faced. From 10 to 25 percent of the area of most of the rms is set aside for research, which is conducted by State college periment stations and cooperating agricultural agencies such as the gricultural Research Administration and the Soil Conservation rvice. The research may include investigations regarding fertilizer requirements, handling of problem soils, water requireme plant diseases, insect pests, and other problems peculiar to a parti lar area. After methods have been developed from the research a thoroughly tested they also are demonstrated on the farms.

Some of the farms have served the additional purpose of aiding determining the feasibility of projects. The farms which are t operated by the owners are leased to carefully selected experien farmers as soon as the land is cleared and leveled and the necess buildings have been constructed. This method of operation has sulted in the farms becoming self-supporting.

There were 10 development farms in operation during fiscal y 1960 and 18 farms previously operated have been discontinued beca they have served their purpose. The existing farms are located in Wellton-Mohawk division of the Gila project, Ariz., and in seve units of the Missouri River basin project in regions 6 and 7. Ad tional farms are proposed for new areas scheduled for development

The Bureau of Reclamation and other agencies responsible for development farms work closely with the State college extension se ices to be certain that the information from research findings a demonstrations is properly disseminated to the new settlers. Hu dreds of farmers attend the annual field days and tours at which rep sentatives of the Bureau and the cooperating agencies explain t work in detail. The settlers are encouraged to visit the farms at a time during the year to obtain information. Pamphlets are prepar and distributed which supply data on the crops raised, yields, a other pertinent information. In addition to project farmers the velopment farms benefit college and high school students who visit t farms with their instructors.

## *Land Settlement*

The Bureau conducted two land openings on the Columbia bas project, Washington State, making available for settlement a total 39 farm units.

Since the close of World War II, a total of 2,816 farm uni consisting of 271,108 irriagable acres, have been made available f settlement, either by homesteading or by purchase.

Settlers do not pay for the public land which is opened to hom steading. Government-acquired lands are sold to settlers as far units. In either case, settlers pay to the Federal Government, throug an irrigation district, or other recognized water-users' organizatio the pro rata share of the construction costs of irrigation facilities bui to supply the land with water. They also pay an annual charge f eration and maintenance of the irrigation works. The construction sts are paid without interest over a long period, usually 40 or 50 ars.

## *Towns Are Born at Reclamation Projects*

The Boulder City Act of 1958 established conditions for local self-vernment by the people of Boulder City, Nev., a town developed in nstruction of Hoover Dam. The Federal Government transferred a municipal corporation established under the act, its interest in unicipal properties, utilities, and associated facilities. Concurrently idential and commercial properties, owned by the Federal Gov-nment, were sold into private ownership, thus creating a basis for nplete assumption of the responsibilities of self-government by the wly created corporate municipality.

Ownership of slightly over 21,600 acres of land valued at $2,393,900 s transferred from the United States to the municipality. Through sale of federally owned residences in the city, properties having otal appraised value of $1,224,800 were added to the tax rolls. Mu-ipal electric, water, and sewerage systems, municipal buildings, eets and associated public use areas, together with related equipment d property representing a value of approximately $2,500,000 were o turned over to the municipality. School buildings in Boulder ty, representing a total investment of $1,552,554 were transferred the Clark County School District. The Bureau is completing the bdivision of that portion of Boulder City known as Lakeview Addi-n, pursuant to provisions of the Boulder City Act of 1958. On npletion of this work, this last remaining area will be transferred the municipality.

In connection with construction of the Colorado River storage proj-, Glen Canyon unit, Ariz., it was deemed necessary to establish a wnsite at Glen Canyon damsite in order to provide necessary hous-g, municipal services and attendant benefits for the construction force ployed there. The resultant town of Page, Ariz., is well on its way ward becoming a full fledged municipality. Subdivision has been complished, streets have been paved, and public utilities made avail-le throughout the central area. Permanent commercial establish-ents are now being constructed by a variety of private operators who ve taken advantage of the sale of commercial and residential lots acquire the property necessary for such purposes.

It is currently anticipated that the community will continue to grow ring the remainder of the construction period and reach a popula-n of approximately 3,500 inhabitants. Although municipal ad-nistration and management is still retained by the United States, all plans are being made with the objective of facilitating transfe these functions to an appropriate municipal corporation at the earl moment. It is thus hoped that with the conclusion of construct Page, Ariz., will have become established to a degree that will per its successful continuation as a tourist and recreational center in a ciation with the nearby major project feature and other scenic att tions of the Southwest.

### *Land-Use Management*

During the fiscal year, legal action was initiated by the Departm of Justice to evict a number of trespassers on reclamation-withdra land along the lower Colorado River in Arizona and California. was estimated that this illegal use of Federal lands may extend as much as 27,000 acres. At the time the legal action was taken Department announced that a land-use program for the lower ri area was under consideration.

## *Water and Money Saved by Maintenance and Resear*

The review of maintenance program, initiated in 1948 to prot the Government's investment in constructed irrigation works, n provides for the periodic examination of 677 individual structures irrigation systems on 101 projects. Regularly scheduled field revie of the maintenance programs for major structures and facilities w made during the year. Also, special examinations were made of s cific problems. The periodic examinations provide assurance of t structural safety of individual features and improved operating e ciency of the systems as a whole.

The 677 structures and facilities now subject to examination unc the program include 187 storage dams; 117 diversion dams and hea works; 95 major and important pumping plants; 90 features of s cial importance to particular projects, such as desilting works, sipho and tunnels; and 188 carriage, distribution and drainage systems. the 57 additional structures covered under the review of maintenan program for the first time during the past year, 17 storage and 16 version dams and several of the more important pumping plants we included.

Improved maintenance and repair of project works can be judg from the fact that the backlog of urgently recommended actions the early years of the program has been drastically reduced. The also has been a reduction in the less urgent recommendatio Some of the reduction can be attributed to several project rehabilit tion programs now under way on several of the older projects, such pair and rehabilitation of Sherburne Lake Dam on the Milk River oject, the Buffalo Bill Dam on the Shoshone project, replacement of nal linings on the Salt River and North Platte projects, and the en-osing of many laterals in pipe. Most encouraging, however, is the ajor repair and rehabilitation being accomplished by the water users s a part of their general maintenance programs. It is generally rec-gnized that the Review of Maintenance Program has been a major ctor in this general improvement.

## o Build A Better Project

To provide for expanding use of our essentially nonexpandable ater resources, the Bureau is engaged in programs to make conserva-on structures more efficient and to develop ways to cut down on ater waste that occurs through evaporation, nonbeneficial use by ater weeds, and seepage.

A significant achievement during the fiscal year was the develop-ent of standard designs for noncylinder prestressed concrete pres-re pipe. The design is expected to be used in the conveyance of ater under moderately high pressure and should, under certain hy-aulic conditions where this pipe is competitive, produce lower costs r pipelines and conduits for irrigation distribution systems.

A comprehensive review and evaluation of designs of large canals develop improved methods of determining flow resistance in such nals was initiated during the year. The work was undertaken as a sult of findings on the Central Valley project in California, which dicated that the design procedures which had been used satisfac-rily to calculate the capacity of small and medium-sized canals may t be adequate for large canals on flat slopes.

## ower-cost Canal Linings

Loss of water through seepage in canals has for many years been increasing concern to the Bureau of Reclamation and other irriga-on interests, especially in the western United States.

Under the Bureau's lower-cost canal lining program, studies were ntinued to reduce seepage losses from canals and laterals and to event the waterlogging of irrigable lands. New developments un-r the program included experimental installation of plastics as nal linings, methods of detecting seepage, improvement of water easurement, and evaluation of linings installed. The studies showed at plastic materials which were formerly too costly can now be tained at a cost competitive with other materials for use as buried embranes in lining waterways and reservoirs. Three trial canal lining installations of plastic materials, each about 500 feet in leng were made during the year.

An electrical logging device, containing some features not usua found on electrical well-logging equipment and better adapted canal logging, was tested and showed considerable promise as a me of detecting seepage from canals and laterals. The device inclu self-potential measuring equipment which was used to study wat flow through canal soils by picking up the electrical currents genera by the flow. A field test was also completed in which seepage los were traced by tritium, an isotope of hydrogen.

### *Electronic Aids to Reclamation*

During the fiscal year an electronic computer was installed in engineering offices of the Bureau at Denver. The equipment used to solve a diversity of complex problems requiring high spe computation. Extensive computations were made to speed det minations of canal and roadway earthwork quantities on many pr ects. Considerable savings in time and effort resulted from the of the computer equipment for this work. Through the use of computing equipment, engineers were relieved of making ma routine calculations and were able to devote more of their time professional design work.

Electrical designs were prepared for the Trinity, Clear Creek, a Spring Creek powerplants, to be constructed on the Trinity Ri division of the Central Valley project. These powerplants are to supervisory controlled from the project's existing Keswick pow plant. The new plants will be attended only for purposes of main nance, inspection, or for conditions requiring manual operation. T plants will have pushbutton automatic controls so that the generati units may be automatically started and stopped remotely by supe visory control. Designs were also prepared for the Glen Cany powerplant main control board. This will be a circular board, t first control board of this type to be used by the Bureau.

In structural design, progress was made in the design of the Trinit Clear Creek, and Spring Creek powerplants, to achieve maximu economy by duplication and similarity insofar as possible, such equal crane span and crane capacity, equal column spacing, simil arrangement of transformers, similar superstructures having grout masonry and steel siding, and other similarities in general arrang ment. During the year a program was begun to establish desi criteria on the amplitude, frequency, and acceleration of vibration forces in hydroelectric powerplants.

To supply additional information on the ability of various meta to perform satisfactorily under high-pressure sliding contact, tes re initiated to determine the friction coefficients and bearing values r various combinations of bronze, monel metal, and stainless steel ed in high-pressure slide gates. The data thus obtained were used specifying improved seating metal for the slide gates at Glen nyon and Navajo Dams.

### *search Reduces Water Waste*

Laboratory and field investigations of a monomolecular layer (an visible chemical film one molecule thick) for reservoir evaporation duction were continued. Screening tests were made on various fatty ohols and other film forming materials. Monomolecular layer be- vior tests were performed at Boulder Basin of Lake Mead at Hoover m, and at Lake Sahuaro at Stewart Mountain Dam in Arizona.

The tests indicated that the persistence of a film on large lakes and servoirs under reasonable wind conditions may be greater than pre- ously anticipated. A new method by scientists of the Bureau of eclamation's engineering laboratories at Denver, by which melted aterial is sprayed from automatic dispensers, was developed for use reservoir evaporation reduction tests. The method of film forma- n and maintenance of the film promises to be much more efficient d economical than methods previously used.

Research investigations in the control of aquatic weeds, being per- rmed in cooperation with the Agricultural Research Service of the epartment of Agriculture, included the study of copper-bearing tifouling paints (originally developed to prevent marine organisms om adhering to ship bottoms) for the control of algae growth that nds to reduce the capacity of concrete canals and flumes. The results field and laboratory tests indicated that a number of the paints had cellent algaecidal properties. Increased attention was given to the dies of aquatic weed problems in large canals of the far western ates. Solvent type aquatic herbicides were evaluated for their per- rmance in bioassay tests.

### *War on Weeds*

The comprehensive weed control program conducted by the Bureau Reclamation is continuing to prove very effective in reducing the oblems caused by undesirable vegetation and in decreasing operation d maintenance costs. It also is aiding materially in reducing water sses resulting from transpiration, evaporation, and seepage due to eed growths.

The research program conducted in cooperation with the Bureau the Department of Agriculture is resulting in the development of ore efficient and economical methods of controlling weeds infesting banks and channels of irrigation and drainage systems. This pl of the program is being accomplished at four field stations in West, and in the Assistant Commissioner and Chief Engineer's w control laboratory in Denver. The cooperative research progra the laboratory has been enlarged and now two Bureau of Reclamat and two Department of Agriculture scientists are devoting full t to this work.

The ditchbank seeding program to prevent and control w growths and erosion was continued with excellent results. The ed tional program which has been so successful in advising pro personnel on new and more economical methods for controlling we also was continued through the distribution of motion pictures, sl lectures, manuals, special releases on new equipment, and article the Reclamation Era.

Work was continued for developing more effective methods controlling salt cedar (tamarisk) in the Southwest. Progress made also in controlling other woody phreatophytes where these pla have invaded irrigation systems, natural water courses, reservoirs, a other areas. These growths not only usurp millions of acre-feet water so greatly needed for irrigation, municipal, and industrial p poses, but increase flood hazards and take over lands which should used for grazing and agriculture. It is estimated that in the 17 c tiguous western States, undesirable phreatophytes infest over million acres and transpire at least 25 million acre-feet of wat Committees composed of representatives of the Departments of Ag culture and Interior, including the Bureau of Reclamation, are wo ing on this and other weed control problems common to Governm agencies.

Much progress has been made in reducing costs and water los due to weeds on irrigation systems in a comparatively short ti through the Bureau's weed control program. It is estimated t in fiscal 1960 the losses due to weeds on irrigation systems were duced several million dollars annually as compared to 1948. Ho ever, all weed problems have not been solved as economically as sired. Therefore, research is being continued as planned to aid solving this major problem of irrigation systems.

A halogeton control program has been developed in cooperati with other agencies under the provisions of the Halogeton Glomerat Act (Public Law 529, July 14, 1952) in the interest of increasing t land use value of the lands under the jurisdiction of the Bureau a of protecting the livestock. It is known that this poisonous weed i fests Bureau lands in Utah, Nevada, Colorado, Wyoming, and Ida Surveys to locate halogeton infestations were continued as were t cooperative investigations to determine the most effective and ec nomical control methods. The actual control programs includi emical spraying and grass seedings were continued primarily rough agreements with the Department's Bureau of Land Manage- nt.

### *boratory Studies*

Increased emphasis was given to better instrumentation in hydraulic oratory studies. New equipment utilized included a six-channel ect-writing recorder to measure simultaneously, flow, velocity, pres- re, acceleration, vibration, temperature, strain, and other physical enomena at different points on laboratory and field structures and t facilities.

Epoxy resin compounds for bonding fresh mortar to aged mortar d for making epoxy mortars for use in patching spalled concrete, ceived considerable attention in laboratory studies. Several com- unds were selected for field application. Epoxy resins were also aluated in other construction materials, such as protective coatings d joint fillers. In laboratory tests, certain epoxy compounds were und to be effective in resisting the damage caused by the erosive rce of flowing water.

Laboratory studies on the improvement of quality of aggregates r concrete through the method of separating the unsound material ere initiated to find additional ways of improving marginal aggre- tes for use in Bureau concrete structures. The method involves astic properties, that is, the rebound characteristics of an aggregate separate sound, dense particles from less sound particles by the stance of its bounce when it is dropped on a massive, inclined steel ate.

A nuclear instrument for rapidly determining the in-place density d moisture content of soil was evaluated in the laboratories. The strument utilized radioisotopes in probes which can be placed on or the soil. After study in the laboratories, the instrument was given ld trials on two earth dams. The field test data will be analyzed determine the accuracy of the instrument and its potential for future e in earthwork control.

### *rotection of Metalwork*

A new device was developed to measure the corrosiveness of soils d waters to iron and steel. The instrument, an electric resistance rrosion meter, was also used to estimate corrosiveness of various her materials and alloys considered for use in highly saline and idic ground water.

Indicative of increased emphasis on research in protective coatings r metal work was the comprehensive test program initiated during the year in the 6-foot-diameter siphon piping of the Southside Ca on the Collbran project on the Colorado River. Among the new co ings placed under test in the siphon piping were the "accelerated' chemically set materials and metalized zinc and zinc-pigmented co ings. Comparison of the new coatings side by side with curren specified coatings is designed to indicate which offer significan greater durability and economy in preventing corrosion of ferr materials.

Laboratory and field tests during the year disclosed that a sa filled vinyl resin paint system is an economical and durable repla ment for eroded vinyl paint linings in the invert section of steel pi carrying sand-laden water. The paint system proved to be one of best of many evaluated in the laboratory and is suited to new p installations as well as to old installations.

During the year an improved vane-type soil testing apparatus v patented by a Bureau research engineer. The invention is used to termine the in-place shearing resistance of soils. A patent appli tion for a Bureau invention covering a method for large-scale a plication of monomolecular layers of fatty alcohols to water surfa to reduce evaporation from the surfaces was filed in the Pate Office.

## *The Behavior of Water*

The Bureau's Hydrology Branch continued to study the source occurrence of, and use of surface and underground waters where th affect the planning and operation of reclamation projects. For pr posed projects, studies are made to determine the amount and usabili of the available water supply, to determine the amounts and distrib tion of sediment transport loads and depositions, and to determine t design flood conditions. Studies also were continued to improve t reservoir operational criteria so as to attain optimum benefits from t standpoint of irrigation, flood control, hydropower, recreation, fi and wildlife resources, and sediment control.

Studies were made to analyze changes in channel regime caused b the installation of structures in streams and by the extraction or add tion of water to the natural flow pattern of streams.

Cooperative work with the Department's Geological Survey was co tinued on the measurement of water consumption by salt cedars in th Salt River Valley of Arizona. Six large lysimeters are being use to measure the water consumption of both beneficial crops and no beneficial phreatophytes.

The basinwide hydrometeorological study of probable storms fo aid in spillway design for the eastern slopes of the Sierra Nevad

ıd for the Rogue River basin was continued. Six detailed unit hy-
ograph studies were prepared for exchange through the Inter-
gency Committee on Water Resources.

Cooperative investigations of the effects of land treatment and
nservation practices on yield of streamflow were continued with
e Agricultural Research Service and Soil Conservation Service of
e Department of Agriculture.

Coordination continued with the Corps of Engineers, Department
the Army, in the preparation of flood control operating rules for
veral Bureau reservoirs. Study was initiated on emergency operat-
g rules for use in spillway design.

Preliminary analyses were completed to evaluate the complex rela-
onships of precipitation and temperature to snowmelt and glacier
elt runoff in several Alaskan streams.

## *Water Research Is a Literate Undertaking*

A major publication issued during the year was the comprehensive
ok, Design of Small Dams. The book presents instructions, stand-
ds, and procedures for use in the design of small dams. It is in-
nded to serve primarily as a guide to safe practices for those con-
rned with the design of small dams in public works programs in
e United States.

A pamphlet, Irrigation on Western Farms, written and published
intly by the Bureau of Reclamation and the Soil Conservation Serv-
e, Department of Agriculture, summarizes the technological ad-
nces that have been made in irrigation practices within the past
years. It retails for 40 cents. Design of Small Dams sells for
.50. Both books are available at the office of the Superintendent of
ocuments, U.S. Government Printing Office, Washington 25, D.C.,
the Bureau of Reclamation, Attention Code 841, Denver Federal
enter, Building 53, Denver 25, Colo.

Also published were technical records on the design and construc-
on of Tecolote Tunnel, Delta-Mendota Canal, Glen Canyon bridge,
achuma Dam, Folsom powerplant and switchyard, and Kortes Dam
d powerplant. An engineering monograph on a rapid method of
nstruction control for embankments of cohesive soil was issued
ring the year.

The Bureau's research accomplishments during the past 10 years
ere described in a publication entitled "Research—Engineering
ethods and Materials," issued in fiscal year 1960. In addition to
mmarizing accomplishments, the publication described research in
ogress and that planned for the future.

*One of 22.7 million recreational visits to reclamation reservoirs. Annual rec*
*tional use increased 17 percent over 1958 and 139 percent over 1955.*

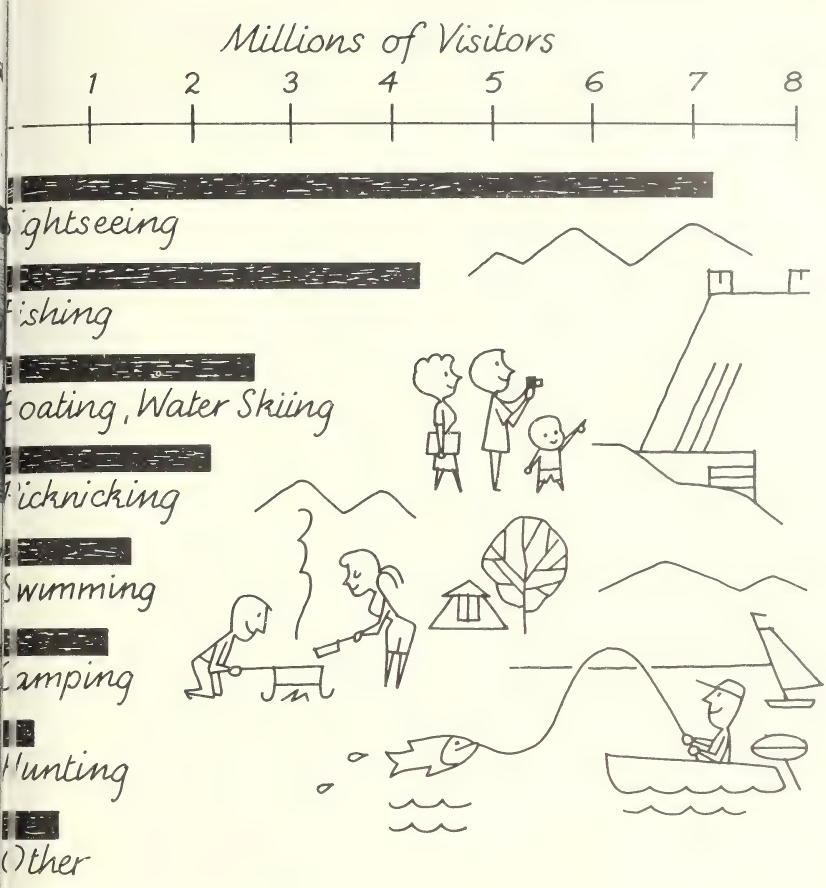
Issued during the year were 139 laboratory reports covering
search and testing in concrete and concrete materials, earth materi
hydraulics, bituminous construction, protective coatings, corrosion
metals, structural problems, seepage control, and weed control.

## *The Public Enjoys Reclamation Reservoirs*

### *Recreation Use Reaches New High*

The impressive upsurge in public use of reclamation projects th
has been apparent for the past several years continues unabated.
calendar year 1959 recreational use on the 174 reservoirs and oth
public use areas in the 17 contiguous western States totaled 22.7 m
lion visitor days. The following tabulation shows the principal acti
ities comprising this use:

| Activity: | *Number of visi days* |
|---|---|
| Sightseeing | 8, 608, 3 |
| Fishing | 4, 797, 5 |
| Boating & Waterskiing | 3, 438, 9 |
| Picnicking | 2, 740, 8 |
| Swimming | 1, 579, 2 |
| Camping | 1, 061, 6 |
| Hunting | 346, 7 |
| Other | 145, 9 |
| Total | 22, 719, 3 |



creational use during 1959 represents an increase of 3.2 million sitor days over the 19.4 million reported for calendar year 1958, and ore than double the use reported in 1955.

The absence of general authority to construct recreational facilities th Federal funds on older projects poses many problems for organi- tions having responsibility for public use administration of recla- ation reservoir areas. These organizations (mostly States and coun- s or their administrative subdivisions) to which authority for pub- use administration has been transferred, often find that available nds do not keep pace with increases in public use. These problems nerally are not characteristic of nationally significant recreation eas administered by the Department's National Park Service, or res- voir areas within national forests administered by the U.S. Forest rvice of the Department of Agriculture. Inequities of the present uation are being recognized on many new projects where nonreim- rsable Federal funds have been and are being provided in project authorizations. An example of this latter situation, where recreat has been recognized in the project authorization, is the Color River storage project. If the problem of adequate financing car overcome reclamation reservoirs will undoubtedly prove to be e more effective in meeting public use demands for recreation.

### *Better Habitat for Fish and Wildlife*

The value of reclamation development for fish and wildlife p poses has been recognized since the beginning of the reclamation p gram in 1902. The resource potentials of reclamation reservoirs other project works has been only partially utilized, however, beca of limitations in general authority to carry out appropriate fish wildlife development programs. In specific instances authorizing l islation has provided such authority in connection with certain s cific project features. In other instances fish and wildlife devel ments have been carried forward under State programs through f mal agreements with the Bureau of Reclamation. Obviously, p grams of this kind have been only partially adequate in utilizing pr ect resources that were appropriate for fish and wildlife.

Enactment of the Fish and Wildlife Coordination Act on Aug 12, 1958 (Public Law 624, 85th Congress, 2d sess., 72 Stat. 56 strengthened Federal responsibility for fish and wildlife developm on new reclamation projects. This act provides that equal conside tion be given, in the project development process, to fish and wildl along with other reclamation functions. New reclamation proje include evaluation of fish and wildlife in the development of proj plans and in the allocation of project costs.

A specific fishery enhancement project under this program was t redesign of outlets for the Whiskeytown Dam, on California's Trin River division, to provide for water releases from two levels in t dam to improve temperature control for the conservation of fish.

## *Good Neighbor Help for Arid Lands Overseas*

At the request of the Department of State, the Bureau of Reclam tion entered into an agreement with the International Cooperati Administration to assist the Helmand Valley Authority of the Go ernment of Afghanistan in bringing the Helmand Valley project t more satisfactory level of operating efficiency. An initial team w assigned to this project to lay the groundwork for an expanded oper tion for the next 3 to 5 years. This group will provide the Afgha with technical advice and on-the-job training in the operation a maintenance of an irrigation system.

The previously established project undertaking the reconnaissance the Blue Nile River basin in Ethiopia, as part of the ICA program r that country, was expanded by the end of the fiscal year. Visual connaissance of the basin was completed by helicopter, the basic drologic net established, and extensive geologic, and preliminary il classification investigations accomplished.

Continuing activities in support of the U.S. Government's technical d program consisted of providing on-the-job training of foreign gineers and technicians at Bureau of Reclamation facilities, and the ovision of reclamation specialists for short details to various coun- ies on specific problems. The training program has seen 369 people om 35 countries spend from a few days up to a full year in various ureau offices. The following special groups were included in this ogram:

1. *FAO Watershed Study Group.*—This group composed of 32 par- ipants from 19 different countries made a 2-month coast-to-coast ur including visits to the Riverton, Central Valley, and Salt River ojects.

2. *Japanese Agriculture Productivity Team.*—This group of six panese agricultural officials was escorted on a 3-month tour of ureau projects and other agricultural areas by three Bureau repre- ntatives, each accompanying the group for 1 month.

The detailing of Bureau specialists to assist various countries with ecific problems involved visits to 12 countries and provided advice problems of design, construction, operations, farm settlement, ology, and project planning. In addition, extended personnel signments were continued, providing advisory services on design and nstruction problems of the Snowy Mountains project in Australia d to completion of the Wu Sheh project in Formosa. All these tivities were undertaken at the request of the International Coopera- n Administration, the United Nations, or the government of the reign country involved through the International Educational Ex- ange Service of the Department of State. Funds to cover all costs this program are provided by the agency requesting the services.

BLE 1.—*Major Bureau of Reclamation contracts awarded in fiscal year 1960*

| Feature | Project | Amount of award |
|---|---|---|
| in Buttes Dam | San Angelo | $11, 836, 428 |
| mile of inlet channel for Spring Creek power conduit, 2.4 iles of tunnels, 2.6 miles of Rock Creek concrete siphon, rinity River division. | Central Valley | 11, 617, 104 |
| ht 155,500-horsepower hydraulic turbines for Glen anyon powerplant. | Colorado River storage | 6, 392, 000 |
| miles of pipeline for Foss aqueduct and Clinton, Bessie, nd Cordell laterals, Foss division. | Washita Basin | 3, 826, 245 |
| inging conductors and overhead ground wires for 310 miles f Ft. Peck-Dawson County-Bismarck 230-kv transmission ne. | Fort Peck and Missouri River basin. | 3, 080, 053 |
| d Willow Dam, Frenchman-Cambridge division | Missouri River basin | 3, 045, 606 |

TABLE 1.—*Major Bureau of Reclamation contracts awarded in fiscal year 19*—Continued

| Feature | Project | Amo aw |
|---|---|---|
| Clear Creek powerplant, Trinity River division | Central Valley | $2, |
| 21.6 miles of Wellton-Mohawk main conveyance channel | Gila | 2, |
| Prosser Creek Dam | Washoe | 2, |
| Sherman Dam, Farwell unit | Missouri River basin | 2, |
| Penstocks for Clear Creek and Trinity powerplants, Trinity River division. | Central Valley | 1, |
| 10.9 miles of Culbertson Extension Canal and 19.6 miles of laterals, wasteways, and drains, Frenchman-Cambridge division. | Missouri River basin | 1, |
| 22.6 miles of Wellton-Mohawk main conveyance channel | Gila | 1, |
| Constructing foundations and furnishing and erecting steel towers for 57 miles of Oahe-Ft. Thompson 230-kv. transmission line. | Missouri River basin | 1, |
| 16.1 miles of Culbertson Extension Canal, 19.5 miles of laterals and wasteways, and 1.5 miles of drains, Frenchman-Cambridge division. | do | 1, |
| Constructing foundations and furnishing and erecting steel towers for 84 miles of Jamestown-Fargo 230-kv. Transmission Line No. 2. | do | 1, 3 |
| 48.7 miles of Block 80 laterals and wasteways, West Canal | Columbia Basin | 1, 2 |
| 16.5 miles of pipelines for lateral and sublaterals, Tea Pot Dome Water District. | Central Valley | 1, 2 |
| Trinity Powerplant, Trinity River division | do | 1, 0 |

TABLE 2.—*Principal features completed on Bureau of Reclamation project fiscal year 1960*

| Feature | Project | State |
|---|---|---|
| Potholes East Canal Enlargement | Columbia Basin | Washington. |
| 4 miles Wahluke Branch Canal | do | Do. |
| 56 miles Royal Branch Laterals, Block 82 | do | Do. |
| Sand Hollow Pumping Plant | do | Do. |
| Enlargement of Little Wood River Dam | Little Wood River | Idaho. |
| Green Springs Powerplant | Rogue River basin | Oregon. |
| 9 miles Howard Prairie Delivery Canal | do | Do. |
| Keene Creek Dam | do | Do. |
| Green Springs Power Conduit | do | Do. |
| Ashland Lateral Diversion Dam | do | Do. |
| Phoenix Canal Diversion Dam | do | Do. |
| Wasco Dam | Wapinitia | Do. |
| Armature Windings for Shasta powerplant units U-1 and U-2. | Central Valley | California. |
| Five pumping plants | Ventura | California. |
| South Gila Drain No. 2 | Colorado River front work and levee system. | Arizona. |
| Bypass lines for Wellton-Mohawk pumping plants No. 1, 2, and 3. | Gila | Do. |
| Sheep Creek Barrier Dam | Paria River basin | Utah. |
| Vega Dam | Collbran | Colorado. |
| Southside Tunnel | do | Do. |
| Parking area and utilities for block 17, Page, Ariz | Colorado River storage | Arizona. |
| Rehabilitation of Little Sandy diversion works | Eden | Wyoming. |
| 1st stage earthwork for Willard Dam | Weber Basin | Utah. |
| 2 trunklines with 4 miles of pipeline and 4 pumping plants on Davis aqueduct. | do | Do. |
| 8 small reservoirs and Bountiful subdistrict laterals, 0.6-mile pipeline. | do | Do. |
| Channelization of Rio Grande in Albuquerque area unit 3. | Middle Rio Grande | New Mexico. |
| Channelization of Rio Grande in Belen area and construction of 5 miles of San Juan feeder canal. | do | Do. |
| Fort Cobb Dam | Washita Basin | Oklahoma. |
| 11.5 miles Spokane Bench laterals for Helena Valley canal. | Missouri River basin | Montana. |
| 165 miles Fargo-Granite Falls 230-kv transmission line | do | North Dakota |
| 37 miles Boysen-Pilot Butte 115-kv transmission line | do | Wyoming. |
| Left abutment outlet works for Buffalo Bill Dam | Shoshone | Do. |
| 17 miles final section Courtland Canal and laterals | Missouri River basin | Kansas. |
| 5.5 miles White Rock Canal and laterals | do | Do. |
| Fremont Canyon powerplant structure and power conduit. | do | Wyoming. |
| 31 miles 3rd section Osborne Canal and laterals | do | Kansas. |
| Reconductoring 29 miles of Flatiron-Greeley 115-kv transmission line. | do | Colorado. |

| State and project | Irrigable area for service | | | | Irrigated area | Gross crop value | |
|---|---|---|---|---|---|---|---|
| | Full | Supplemental | Temporary | Total | | Amount | Per irrigated acre |
| Arizona: | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | | |
| Gila | 103,488 | 0 | 0 | 103,488 | 78,071 | $13,738,680 | $175.98 |
| Salt River | 238,787 | 95,730 | 0 | 334,517 | 228,833 | 67,577,067 | 295.31 |
| Yuma (see also California) | 51,936 | 0 | 0 | 51,936 | 44,915 | 19,160,950 | 426.60 |
| Yuma Auxiliary | 3,406 | 0 | 0 | 3,406 | 2,932 | 711,150 | 242.55 |
| Subtotals | 397,617 | 95,730 | 0 | 493,347 | 354,751 | 101,187,847 | 285.24 |
| California: | | | | | | | |
| Boulder Canyon | 608,530 | 0 | 0 | 608.530 | 494,100 | 146,777,141 | 297.06 |
| Cachuma | 500 | 26,610 | 0 | 27.110 | 11,982 | 7,154,986 | 597.14 |
| Central Valley | 33,855 | 816,196 | 32,323 | 882,374 | 722,369 | 224,452,703 | 310.72 |
| Klamath (see also Oregon) | 80,913 | 0 | 0 | 80,913 | 77,100 | 10,373,978 | 134.55 |
| Orland | 19,811 | 0 | 0 | 19,811 | 17,499 | 1,466,308 | 83.79 |
| Santa Maria | 0 | 39,215 | 0 | 39,215 | 33,058 | 27,071,107 | 818.90 |
| Solano | 0 | 6,409 | 0 | 6,409 | 2,569 | 565.835 | 220.25 |
| Ventura River | 530 | 475 | 0 | 1,005 | 566 | 265,688 | 469.41 |
| Yuma (see also Arizona) | 14,620 | 0 | 0 | 14,620 | 10,608 | 2,533,064 | 238.79 |
| Subtotals | 758,759 | 888.905 | 32,323 | 1,679,987 | 1,369,851 | 420,660,810 | 307.09 |
| Colorado: | | | | | | | |
| Colorado-Big Thompson | 0 | 720,000 | 0 | 720,000 | 720.000 | 82,887,626 | 115.12 |
| Fruitgrowers Dam | 0 | 2,662 | 0 | 2,662 | 1,811 | 238,486 | 131.69 |
| Grand Valley | 34,686 | 7,995 | 0 | 42,681 | 34,789 | 5,751,790 | 165.33 |
| Mancos | 0 | 8.650 | 0 | 8,650 | 7,232 | 290,033 | 40.10 |
| Paonia | 0 | 13,070 | 0 | 13,070 | 8,581 | 992,061 | 115.61 |
| Pine River (see also New Mexico) | 0 | 40,198 | 0 | 40,198 | 34,626 | 1,461,221 | 42.20 |
| Pine River Indian irrigation | 0 | 13,000 | 0 | 13,000 | 9,392 | 393,731 | 41.92 |
| Uncompahgre | 76,439 | 0 | 0 | 76,439 | 63,564 | 5,425,660 | 85.36 |
| Subtotals | 111,125 | 805,575 | 0 | 916,700 | 879,995 | 97,440.608 | 110.73 |
| Idaho: | | | | | | | |
| Avondale | 873 | 0 | 0 | 873 | 511 | 30.597 | 59.88 |
| Boise (see also Oregon) | 223,065 | 136,115 | 0 | 359,186 | 325,368 | 40,299.778 | 123.86 |
| Dalton Gardens | 944 | 0 | 0 | 944 | 536 | 42,606 | 79.49 |
| Lewiston Orchards | 3,590 | 0 | 0 | 3,590 | 2,002 | 501,692 | 250.60 |
| Little Wood River | 0 | 5,191 | 0 | 5,191 | 5,191 | 356,242 | 68.63 |
| Michaud Flats | 9,532 | 0 | 0 | 9,532 | 7,270 | 1,056,584 | 145.33 |
| Minidoka | 214,642 | 932,361 | 473 | 1,147,476 | 1,077,012 | 119,182,317 | 110.66 |
| Owyhee (see also Oregon) | 33,360 | 0 | 0 | 33,360 | 31,319 | 4,148,190 | 132.45 |
| Preston Bench | 0 | 4,500 | 0 | 4,500 | 3,864 | 412,095 | 106.65 |
| Rathdrum Prairie | 5,010 | 0 | 0 | 5,010 | 4,111 | 379,226 | 92.25 |
| Subtotals | 491,016 | 1,078,167 | 473 | 1,569,656 | 1,457,184 | 166,409,327 | 114.20 |

TABLE 3.—*Irrigation and gross crop value data, by projects, for each State, 1959*—Continued

| State and project | Irrigable area for service |  |  |  | Irrigated area | Gross crop value |  |
|---|---|---|---|---|---|---|---|
|  | Full | Supplemental | Temporary | Total |  | Amount | Per irrigated acre |
| Kansas: |  |  |  |  |  |  |  |
| Missouri River basin: |  |  |  |  |  |  |  |
| Bostwick division: | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* |  |  |
| Courtland unit | 31, 566 | 0 | 0 | 31, 566 | 16, 240 | $1, 056, 668 | $65. 07 |
| Solomon division: |  |  |  |  |  |  |  |
| Kirwin unit | 11, 500 | 0 | 0 | 11, 500 | 6, 470 | 461, 344 | 71. 31 |
| Subtotals | 43, 066 | 0 | 0 | 43, 066 | 22, 710 | 1, 518, 012 | 66. 84 |
| Montana: |  |  |  |  |  |  |  |
| Bitter Root | 16, 665 | 0 | 0 | 16, 665 | 16, 250 | 633, 756 | 39. 00 |
| Buffalo Rapids | 22, 938 | 0 | 0 | 22, 938 | 20, 995 | 1, 493, 599 | 71. 14 |
| Frenchtown | 4, 810 | 0 | 0 | 4, 810 | 3, 803 | 251, 314 | 66. 08 |
| Huntley | 32, 447 | 0 | 0 | 32, 447 | 23, 699 | 1, 758, 620 | 74. 21 |
| Intake | 881 | 0 | 0 | 881 | 731 | 30, 916 | 42. 29 |
| Lower Yellowstone (see also N.Dak.) | 36, 832 | 0 | 0 | 36, 832 | 30, 161 | 2, 094, 899 | 69. 46 |
| Milk River | 134, 170 | 0 | 0 | 134, 170 | 87, 459 | 3, 653, 266 | 41. 77 |
| Missoula Valley | 977 | 0 | 0 | 977 | 460 | 39, 766 | 86. 45 |
| Missouri River basin: |  |  |  |  |  |  |  |
| Three Forks division: |  |  |  |  |  |  |  |
| Crow Creek pump unit | 4, 545 | 0 | 0 | 4, 545 | 3, 399 | 240, 982 | 70. 90 |
| Yellowstone division: |  |  |  |  |  |  |  |
| Savage unit | 2, 215 | 0 | 0 | 2, 215 | 1, 931 | 77, 650 | 40. 21 |
| Sun River | 91, 823 | 0 | 0 | 91, 823 | 68, 200 | 2, 525, 788 | 37. 04 |
| Subtotals | 348, 303 | 0 | 0 | 348, 303 | 257, 088 | 12, 800, 556 | 49. 79 |
| Nebraska: |  |  |  |  |  |  |  |
| Mirage Flats | 11, 662 | 0 | 0 | 11, 662 | 11, 243 | 1, 304, 324 | 116. 01 |
| Missouri River basin: |  |  |  |  |  |  |  |
| Bostwick division: |  |  |  |  |  |  |  |
| Superior-Courtland unit | 23, 110 | 0 | 0 | 23, 110 | 19, 835 | 1, 358, 191 | 68. 47 |
| Frenchman-Cambridge division | 37, 578 | 0 | 0 | 37, 578 | 27, 970 | 2, 322, 063 | 83. 02 |
| Middle Loup division: |  |  |  |  |  |  |  |
| Sargent unit | 12, 900 | 0 | 0 | 12, 900 | 6, 843 | 570, 514 | 83. 37 |
| Oregon Trail division: |  |  |  |  |  |  |  |
| Glendo unit (see also Wyoming) | 0 | 22, 524 | 0 | 22, 524 | 21, 125 | 2, 058, 711 | 97. 45 |
| North Platte (see also Wyoming) | 171, 571 | 92, 398 | 0 | 263, 969 | 247, 460 | 24, 126, 429 | 97. 50 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Newlands | 71,812 | 0 | 0 | 71,812 | 55,895 | 3,417,904 | 61.15 |
| Truckee Storage | 0 | 28,978 | 0 | 28,978 | 21,362 | 1,840,333 | 86.15 |
| Subtotals | 71,812 | 68,611 | 0 | 140,423 | 106,032 | 7,347,955 | 69.30 |
| New Mexico: | | | | | | | |
| Carlsbad | 25,055 | 0 | 0 | 25,055 | 19,682 | 4,883,608 | 248.13 |
| Fort Sumner | 6,500 | 0 | 0 | 6,500 | 5,279 | 473,301 | 89.66 |
| Middle Rio Grande | 121,680 | 0 | 0 | 121,680 | 54,300 | 4,139,493 | 76.23 |
| Pine River (see also Colorado) | 0 | 0 | 943 | 943 | 892 | 48,970 | 54.90 |
| Rio Grande (see also Texas) | 102,082 | 0 | 0 | 102,082 | 84,920 | 24,513,196 | 288.66 |
| Tucumcari | 41,411 | 0 | 0 | 41,411 | 33,727 | 1,801,467 | 53.41 |
| Vermejo | 7,379 | 0 | 0 | 7,379 | 4,693 | 153,962 | 32.81 |
| Subtotals | 304,107 | 0 | 943 | 305,050 | 203,493 | 36,013,997 | 176.98 |
| North Dakota: | | | | | | | |
| Buford-Trenton | 7,655 | 0 | 0 | 7,655 | 6,490 | 430,154 | 66.28 |
| Lower Yellowstone (see also Montana) | 19,388 | 0 | 0 | 19,388 | 15,844 | 1,082,470 | 68.32 |
| Missouri River basin: | | | | | | | |
| Heart division: | | | | | | | |
| Dickinson unit | 400 | 0 | 0 | 400 | 314 | 20,301 | 64.65 |
| Heart Butte unit | 2,463 | 0 | 0 | 2,463 | 1,007 | 65,359 | 64.90 |
| North Dakota pumping division: | | | | | | | |
| Fort Clark unit | 2,039 | 0 | 0 | 2,039 | 1,319 | 73,839 | 55.98 |
| Subtotals | 31,945 | 0 | 0 | 31,945 | 24,974 | 1,672,123 | 66.95 |
| Oklahoma: | | | | | | | |
| W. C. Austin | 47,809 | 0 | 0 | 47,809 | 37,414 | 4,467,145 | 119.40 |
| Subtotals | 47,809 | 0 | 0 | 47,809 | 37,414 | 4,467,145 | 119.40 |
| Oregon: | | | | | | | |
| Arnold | 4,292 | 0 | 0 | 4,292 | 2,789 | 130,001 | 46.61 |
| Baker | 0 | 7,281 | 0 | 7,281 | 7,260 | 438,412 | 60.39 |
| Boise (see also Idaho) | 1,696 | 0 | 0 | 1,696 | 1,410 | 105,687 | 74.96 |
| Burnt River | 0 | 15,616 | 0 | 15,616 | 15,489 | 932,686 | 60.22 |
| Crescent Lake Dam | 6,650 | 0 | 0 | 6,650 | 6,005 | 402,001 | 66.94 |
| Crooked River (formerly Ochoco) | 8,500 | 0 | 0 | 8,500 | 8,319 | 1,032,326 | 124.09 |
| Deschutes | 50,000 | 48,990 | 0 | 98,990 | 90,462 | 11,713,714 | 129.49 |
| Grants Pass | 10,370 | 0 | 0 | 10,370 | 7,339 | 736,140 | 100.31 |
| Klamath (see also California) | 135,042 | 0 | 0 | 135,042 | 120,855 | 13,764,266 | 113.89 |
| Owyhee (see also Idaho) | 71,656 | 13,000 | 0 | 84,656 | 79,612 | 12,975,364 | 162.98 |
| Rogue River basin | 0 | 23,801 | 0 | 23,801 | 20,941 | 5,550,489 | 265.05 |
| Umatilla | 17,859 | 12,901 | 525 | 31,285 | 24,669 | 2,409,709 | 97.68 |
| Vale | 32,000 | 0 | 0 | 32,000 | 31,388 | 2,605,049 | 83.00 |
| Subtotals | 338,065 | 121,589 | 525 | 460,179 | 416,538 | 52,795,844 | 126.75 |

TABLE 3.—*Irrigation and gross crop value data, by projects, for each State, 1959*—Continued

| State and project | Irrigable area for service | | | | Irrigated area | Gross crop value | |
|---|---|---|---|---|---|---|---|
| | Full | Supplemental | Temporary | Total | | Amount | Per irrigated acre |
| South Dakota: | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | | |
| Belle Fourche | 57, 183 | 0 | 0 | 57, 183 | 55, 321 | $3, 418, 742 | $61. 80 |
| Missouri River basin: | | | | | | | |
| Cheyenne Division: | | | | | | | |
| Angostura unit | 12, 135 | 0 | 0 | 12, 135 | 11, 382 | 849, 772 | 74. 66 |
| Rapid Valley | 0 | 8, 900 | 0 | 8, 900 | 6, 386 | 257, 458 | 40. 32 |
| Subtotals | 69, 318 | 8, 900 | 0 | 78, 218 | 73, 089 | 4, 525, 972 | 61. 92 |
| Texas | | | | | | | |
| Balmorhea | 0 | 10, 608 | 0 | 10, 608 | 5, 558 | 1, 194, 152 | 214. 85 |
| Rio Grande (see also New Mexico) | 76, 114 | [1] 18, 330 | 0 | [2] 94, 444 | 66, 015 | 18, 168, 844 | 275. 22 |
| Subtotals | 76, 114 | [1 2] 28, 938 | 0 | [2] 105, 052 | 71, 573 | 19, 362, 996 | 270. 53 |
| Utah | | | | | | | |
| Hyrum | 0 | 6, 800 | 0 | 6, 800 | 5, 839 | 371, 205 | 63. 57 |
| Moon Lake | 0 | 75, 256 | 0 | 75, 256 | 58, 040 | 1, 548, 505 | 26. 68 |
| Newton | 0 | 2, 600 | 0 | 2, 600 | 2, 151 | 139, 814 | 65. 00 |
| Ogden River | 0 | 22, 867 | 0 | 22, 867 | 15, 735 | 2, 332, 965 | 148. 27 |
| Provo River | 0 | 46, 609 | 0 | 46, 609 | 37, 547 | 4, 304, 565 | 114. 64 |
| Sanpete | 0 | 13, 663 | 0 | 13, 663 | 11, 929 | 447, 802 | 37. 54 |
| Scofield | 0 | 15, 609 | 0 | 15, 609 | 13, 889 | 975, 507 | 70. 24 |
| Strawberry Valley | 17, 269 | 21, 340 | 4, 945 | 43, 554 | 40, 657 | 2, 794, 610 | 68. 74 |
| Weber River | 0 | 108, 978 | 0 | 108, 978 | 91, 434 | 10, 613, 029 | 116. 07 |
| Subtotals | 17, 269 | 313, 722 | 4, 945 | 335, 936 | 277, 221 | 23, 528, 002 | 84. 87 |
| Washington | | | | | | | |
| Chief Joseph Dam | 2, 860 | 0 | 0 | 2, 860 | 1, 242 | 242, 433 | 195. 20 |
| Columbia basin | 411, 165 | 0 | 0 | 411, 165 | 266, 590 | 32, 497, 454 | 121. 90 |
| Okanogan | 5, 038 | 0 | 0 | 5, 038 | 4, 090 | 800, 090 | 195. 62 |
| Yakima | 279, 922 | 181, 844 | 160 | 461, 926 | 393, 752 | 85, 887, 453 | 218. 13 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Missouri River basin: | | | | | | | |
| Bighorn basin division: | | | | | | | |
| Hanover-Bluff unit | 6, 527 | 0 | 0 | 6, 527 | 5, 568 | 478, 093 | 85. 86 |
| Owl Creek unit | 0 | 11, 338 | 0 | 11, 338 | 10, 009 | 506, 872 | 50. 64 |
| Oregon Trail division: | | | | | | | |
| Glendo unit (see also Nebraska) | 0 | 8, 732 | 0 | 8, 732 | 6, 322 | 477, 870 | 75. 59 |
| North Platte (see also Nebraska) | 54, 752 | 16, 317 | 0 | 71, 069 | 66, 765 | 5, 988, 275 | 89. 69 |
| Riverton | 53, 857 | 0 | 0 | 53, 857 | 50, 064 | 2, 173, 112 | 43. 41 |
| Shoshone | 93, 369 | 0 | 0 | 93, 369 | 76, 355 | 4, 977, 723 | 65. 19 |
| Subtotals | 249, 593 | 36, 387 | 0 | 285, 980 | 246, 688 | 15, 649, 046 | 63. 44 |
| Total—All States | 4, 311, 724 | 3, 743, 290 | 39, 369 | 8, 094, 383 | 6, 798, 751 | 1, 116, 547, 902 | 164. 23 |

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[1] Area for which service is available under Warren Act contract.

[2] Includes 18,330 acres for which service is available under Warren Act contract.

TABLE 4.—*Acreage, production, and gross crop value by crops and typ*
*crops—1959*

| Crops | Irrigated lands | | Tonnage | | Gross crop va |
|---|---|---|---|---|---|
| | Total | Percent of total | Total | Percent of total | Total |
| Cereals: | *Acres* | *Percent* | *Tons* | *Percent* | |
| Barley | 545, 498 | 8. 02 | 724, 304 | 2. 151 | $29, 609, 616 |
| Corn | 369, 372 | 5. 43 | 772, 938 | 2. 295 | 31, 370, 842 |
| Oats | 177, 970 | 2. 62 | 164, 707 | . 489 | 7, 219, 820 |
| Rice | 7, 395 | . 11 | 14, 771 | . 044 | 1, 217, 610 |
| Rye | 1, 946 | . 03 | 1, 379 | . 004 | 54, 180 |
| Sorghums (sorgo, kaffir, etc.) | 115, 410 | 1. 70 | 171, 149 | . 508 | 7, 475, 822 |
| Wheat | 462, 992 | 6. 81 | 691, 335 | 2. 053 | 37, 251, 971 |
| Other cereals | 103, 538 | 1. 52 | 161, 607 | . 480 | 6, 699, 171 |
| Subtotals | 1, 784, 121 | 26. 24 | 2, 702, 190 | 8. 024 | 120, 899, 032 |
| Forage: | | | | | |
| Alfalfa hay | 1, 629, 301 | 23. 96 | 6, 288, 533 | 18. 673 | 148, 936, 745 |
| Other hay | 189, 131 | 2. 78 | 350, 875 | 1. 042 | 6, 836, 562 |
| Irrigated pasture | 1, 014, 333 | 14. 92 | 2, 562, 929 | 7. 610 | 33, 217, 785 |
| Corn fodder | 12, 675 | . 19 | 63, 778 | . 189 | 527, 298 |
| Silage or Ensilage | 204, 002 | 3. 00 | 3, 413, 614 | 10. 136 | 22, 020, 870 |
| Crop residue: Beet tops | | | 2, 469, 700 | 7. 333 | 1, 507, 164 |
| Stubble, stalks, etc | | | 153, 399 | . 456 | 1, 272, 163 |
| Straw (all kinds) | | | 267, 945 | . 796 | 2, 030, 061 |
| Root crops (carrots, etc.) | 820 | . 01 | 16, 890 | . 050 | 85, 970 |
| Other forage | 44, 308 | . 65 | 108, 082 | . 321 | 508, 037 |
| Subtotals | 3, 094, 570 | 45. 51 | 15, 695, 745 | 46. 606 | 216, 942, 655 |
| Miscellaneous field crops: | | | | | |
| Beans, castor | 1, 531 | . 02 | 1, 280 | . 004 | 153, 519 |
| Beans, dry and edible | 366, 915 | 5. 40 | 326, 837 | . 970 | 41, 305, 809 |
| Broomcorn | 3, 366 | . 05 | 950 | . 003 | 135, 247 |
| Cotton, lint (Upland) | 469, 351 | 6. 90 | 236, 338 | . 702 | 155, 565, 676 |
| Cotton, seed (Upland) | | | 372, 316 | 1. 106 | 16, 217, 646 |
| Cotton, lint (American-Egyptian) | 34, 889 | . 51 | 9, 766 | . 029 | 10, 278, 797 |
| Cotton, seed (American-Egyptian) | | | 17, 089 | . 051 | 779, 147 |
| Hops | 20, 105 | . 30 | 17, 975 | . 053 | 15, 914, 880 |
| Peppermint | 14, 719 | . 22 | 522 | . 001 | 3, 287, 261 |
| Spearmint | 5, 255 | . 08 | 219 | . 001 | 1, 581, 440 |
| Sugar beets | 370, 638 | 5. 45 | 7, 147, 454 | 21. 223 | 76, 670, 105 |
| Other miscellaneous field crops | 2, 059 | . 03 | 2, 806 | . 008 | 276, 307 |
| Subtotals | 1, 288, 828 | 18. 96 | 8, 133, 552 | 24. 151 | 322, 165, 834 |
| Vegetables: | | | | | |
| Asparagus | 16, 486 | . 24 | 21, 996 | . 065 | 4, 623, 889 |
| Beans (processing) | 9, 258 | . 14 | 17, 564 | . 052 | 2, 173, 344 |
| Beans (fresh market) | 923 | . 01 | 2, 370 | . 007 | 805, 250 |
| Broccoli | 11, 329 | . 17 | 32, 336 | . 096 | 4, 922, 552 |
| Cabbage | 6, 165 | . 09 | 81, 973 | . 243 | 4, 922, 894 |
| Carrots | 13, 147 | . 19 | 165, 114 | . 490 | 11, 287, 912 |
| Cauliflower | 2, 201 | . 03 | 17, 009 | . 051 | 1, 709, 901 |
| Celery | 2, 088 | . 03 | 55, 838 | . 166 | 4, 025, 806 |
| Corn, sweet (processing) | 21, 687 | . 32 | 119, 830 | . 356 | 2, 479, 188 |
| Corn, sweet (fresh market) | 8, 419 | . 12 | 29, 132 | . 087 | 2, 759, 223 |
| Cucumbers | 2, 376 | . 03 | 25, 725 | . 076 | 3, 043, 078 |
| Greens (kale, etc.) | 242 | | 1, 454 | . 004 | 226, 208 |
| Lettuce | 63, 279 | . 93 | 447, 024 | 1. 327 | 37, 135, 890 |
| Melons: Cantaloupes, etc | 31, 749 | . 47 | 229, 926 | . 683 | 14, 266, 956 |
| Honey Ball, honeydew, etc | 3, 891 | . 06 | 42, 959 | . 128 | 2, 607, 828 |
| Watermelons | 11, 668 | . 17 | 98, 026 | . 291 | 3, 852, 504 |
| Onions, dry | 16, 758 | . 25 | 259, 183 | . 770 | 10, 100, 303 |
| Onions, green | 123 | | 914 | . 003 | 90, 301 |
| Peas, green (processing) | 11, 898 | . 18 | 22, 142 | . 066 | 1, 817, 051 |
| Peas, green (fresh market) | 1, 041 | . 02 | 1, 819 | . 005 | 330, 416 |
| Peppers (all kinds) | 3, 955 | . 06 | 58, 267 | . 173 | 3, 304, 029 |
| Potatoes, early | 45, 467 | . 67 | 610, 217 | 1. 812 | 20, 121, 007 |
| Potatoes, late | 201, 479 | 2. 96 | 2, 139, 042 | 6. 352 | 58, 374, 846 |
| Squash | 2, 763 | . 04 | 15, 619 | . 046 | 1, 917, 035 |
| Sweet Potatoes | 551 | . 01 | 2, 667 | . 008 | 283, 610 |
| Tomatoes (canning) | 14, 218 | . 21 | 208, 655 | . 620 | 5, 073, 292 |
| Tomatoes (fresh market) | 11, 257 | . 17 | 95, 360 | . 283 | 15, 341, 926 |
| Other vegetables | 6, 125 | . 09 | 41, 821 | . 124 | 3, 588, 015 |
| Subtotals | 520, 543 | 7. 66 | 4, 843, 982 | 14. 384 | 221, 184, 254 |
| Total Nursery | 3, 718 | . 05 | | | 8, 874, 220 |

E 4.—*Acreage, production, and gross crop value by crops and types of crops—1959*—Continued

| Crops | Irrigated lands | | Tonnage | | Gross crop value | |
|---|---|---|---|---|---|---|
| | Total | Percent of total | Total | Percent of total | Total | Percent of total [1] |
| | *Acres* | *Percent* | *Tons* | *Percent* | | *Percent* |
| alfa | 65, 931 | . 97 | 14, 525 | . 043 | $8, 099, 912 | . 73 |
| ver (all kinds) | 38, 050 | . 56 | 7, 574 | . 023 | 4, 040, 480 | . 36 |
| rn | 7, 510 | . 11 | 8, 900 | . 027 | 1, 027, 256 | . 09 |
| xseed | 35, 891 | . 53 | 37, 787 | . 112 | 3, 894, 448 | . 35 |
| ass (all kinds) | 16, 646 | . 24 | 4, 542 | . 014 | 3, 522, 289 | . 32 |
| ttuce | 908 | . 01 | 150 | | 260, 885 | . 02 |
| ion | 1, 319 | . 02 | 262 | . 001 | 509, 877 | . 05 |
| a | 32, 493 | . 48 | 39, 527 | . 117 | 3, 272, 951 | . 29 |
| tato (all kinds) | 912 | . 01 | 9, 496 | . 028 | 432, 854 | . 04 |
| arbeet | 3, 170 | . 05 | 4, 447 | . 013 | 1, 289, 070 | . 11 |
| er seed | 13, 484 | . 20 | 8, 716 | . 026 | 1, 834, 245 | . 16 |
| ubtotals | 216, 314 | 3. 18 | 135, 926 | . 404 | 28, 184, 267 | 2. 52 |
| ples | 44, 180 | . 65 | 441, 966 | 1. 312 | 31, 058, 336 | 2. 78 |
| ricots | 8, 012 | . 12 | 55, 173 | . 164 | 5, 026, 694 | . 45 |
| ries (all kinds) | 2, 386 | . 04 | 9, 817 | . 029 | 3, 993, 160 | . 36 |
| erries | 6, 076 | . 09 | 14, 672 | . 043 | 4, 275, 365 | . 38 |
| rus: | | | | | | |
| Grapefruit | 18, 006 | . 26 | 96, 861 | . 288 | 4, 606, 916 | . 41 |
| Lemons and limes | 13, 006 | . 19 | 125, 485 | . 373 | 5, 357, 421 | . 48 |
| Oranges and tangerines | 30, 527 | . 45 | 326, 429 | . 969 | 28, 367, 788 | 2. 54 |
| tes | 4, 026 | . 06 | 19, 129 | . 057 | 5, 219, 551 | . 47 |
| apes, table | 56, 078 | . 82 | 348, 630 | 1. 035 | 28, 438, 294 | 2. 55 |
| apes, other | 35, 042 | . 52 | 287, 902 | . 855 | 14, 460, 415 | 1. 29 |
| ves | 8, 156 | . 12 | 8, 266 | . 025 | 2, 023, 508 | . 18 |
| aches | 25, 783 | . 38 | 178, 134 | . 529 | 10, 954, 024 | . 98 |
| ars | 24, 771 | . 36 | 165, 169 | . 490 | 11, 004, 498 | . 99 |
| nes and plums | 11, 062 | . 16 | 67, 128 | . 199 | 4, 448, 610 | . 40 |
| er fruits | 3, 248 | . 05 | 8, 983 | . 027 | 1, 228, 403 | . 11 |
| ubtotals | 290, 359 | 4. 27 | 2, 153, 744 | 6. 395 | 160, 462, 974 | 14. 37 |
| nonds | 7, 338 | . 11 | 5, 502 | . 016 | 2, 536, 440 | . 23 |
| ans | 5, 284 | . 08 | 2, 575 | . 008 | 1, 815, 583 | . 16 |
| lnuts | 5, 992 | . 09 | 4, 081 | . 012 | 1, 802, 708 | . 16 |
| er nuts | 189 | | 64 | | 34, 350 | |
| ubtotals | 18, 803 | . 28 | 12, 222 | . 036 | 6, 189, 081 | . 55 |
| gardens and orchards | 22, 186 | . 33 | | | 5, 299, 463 | . 48 |
| otal, all crops | 7, 239, 442 | 106. 48 | 33, 677, 361 | 100. 000 | 1, 090, 201, 780 | 97. 64 |
| ultiple cropped | 583, 407 | 8. 58 | | | | |
| otal harvested cropland and pasture | 6, 656, 035 | 97. 90 | | | | |
| nd not harvested | 124, 812 | 1. 84 | | | | |
| ilding | 17, 904 | . 26 | | | | |
| rrigated | 6, 798, 751 | 100. 00 | | | | |
| nal revenues [2] | | | | | 26, 346, 122 | 2. 36 |
| otal gross crop value | | | | | 1, 116, 547, 902 | 100. 00 |
| igation service | 3, 436, 305 | 50. 54 | | | 551, 340, 439 | 49. 38 |
| mental irrigation service | 3, 327, 273 | 48. 94 | | | 557, 044, 684 | 49. 89 |
| rary irrigation service | 35, 173 | . 52 | | | 8, 162, 779 | . 73 |

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litional revenues are included in computing percentages.

ludes payments received from Federal and commercial agencies.

# *Bonneville Power Administration*

### William A. Pearl, *Administrator*

★ ★ ★

BONNEVILLE POWER ADMINISTRATION, authorized by Bonneville Project Act of 1937, is the designated marketing agenc the Department of the Interior for 17 hydroelectric generating pla of the U.S. Columbia River Power System currently completed under construction.

## *Federal Projects*

Power was marketed during fiscal year 1960 from nine U.S. Co of Engineers plants and four of the Department's Bureau of Recla tion plants with an installed generating capacity of 6,033,250 k watts. These include existing projects and projects under const tion where initial generators have been installed.

With completion of the projects under construction the namepl rating will be 7,594, 250 kilowatts, and with completion of the auth ized projects nameplate rating will be nearly 8,900,000 kilowa Projects existing, under construction and authorized for construct by the Corps of Engineers and Bureau of Reclamation are shown table 1.

## *Generation Added*

Additions to the U.S. Columbia River Power System in fiscal y 1960 have a nameplate rating of 312,000 kilowatts. Four units 78,000 kilowatts each were added at the Corps of Engineers proj The Dalles, leaving two units to be installed for the completed proj

Existing storage capacity usable for power in Federal reserv is 9,868,500 acre-feet. An additional 414,000 acre-feet will be p vided by Cougar and Hills Creek on which construction is underw and 5,343,000 acre-feet will be provided by Libby and Green Pe projects which are authorized for construction.

| Project | Operating agency [1] | Location | Stream | Plant installations | | Date in service (initial unit) | Generation fiscal year 1960 [3] |
|---|---|---|---|---|---|---|---|
| | | | | Number of units | Total capacity kilowatts [2] | | |
| Existing: | | | | | | | |
| Bonneville | CE | Washington-Oregon | Columbia | 10 | 518, 400 | June 1938 | 3, 420 |
| Grand Coulee | BR | Washington | Columbia | 18 | 1, 944, 000 | September 1941 | 11, 924 |
| Hungry Horse | BR | Montana | South Fork Flathead | 4 | 285, 000 | October 1952 | 930 |
| Detroit | CE | Oregon | North Santiam | 2 | 100, 000 | July 1953 | 387 |
| McNary | CE | Washington-Oregon | Columbia | 14 | 980, 000 | November 1953 | 5, 347 |
| Big Cliff | CE | Oregon | North Santiam | 1 | 18, 000 | June 1954 | 101 |
| Lookout Point | CE | Oregon | Middle Fork Willamette | 3 | 120, 000 | December 1954 | 301 |
| Albeni Falls | CE | Idaho | Pend Oreille | 3 | 42, 600 | March 1955 | 252 |
| Dexter | CE | Oregon | Middle Fork Willamette | 1 | 15, 000 | May 1955 | 73 |
| Chief Joseph | CE | Washington | Columbia | 16 | 1, 024, 000 | August 1955 | 4, 349 |
| Chandler | BR | Washington | Yakima | 2 | 12, 000 | February 1956 | 44 |
| The Dalles | CE | Washington-Oregon | Columbia | 14 | 963, 000 | May 1957 | 4, 074 |
| Roza | BR | Washington | Yakima | 1 | 11, 250 | August 1958 | 80 |
| Subtotal | | | | | 6, 033, 250 | | 31, 282 |
| Under construction: | | | | | | | |
| The Dalles (Adds.) | CE | Washington-Oregon | Columbia | 2 | 156, 000 | July 1960 | |
| Hills Creek | CE | Oregon | Middle Fork Willamette | 2 | 30, 000 | December 1961 | |
| Ice Harbor | CE | Washington | Snake | 3 | 270, 000 | December 1961 | |
| Cougar | CE | Oregon | South Fork McKenzie | 2 | 25, 000 | November 1962 | |
| John Day | CE | Washington-Oregon | Columbia | 8 | 1, 080, 000 | June 1967 | |
| Subtotal | | | | | 1, 561, 000 | | |
| Authorized: | | | | | | | |
| Libby | CE | Montana | Kootenai | 4 | 344, 000 | | |
| Lower Monumental | CE | Washington | Snake | 3 | 270, 000 | | |
| Little Goose | CE | Washington | Snake | 3 | 270, 000 | | |
| Lower Granite | CE | Washington | Snake | 3 | 300, 000 | | |
| Green Peter | CE | Oregon | Middle Santiam | 2 | 90, 000 | | |
| Foster | CE | Oregon | South Santiam | 2 | 30, 000 | | |
| Subtotal | | | | | 1, 304, 000 | | |
| Total, 23 projects | | | | | 8, 898, 250 | | |

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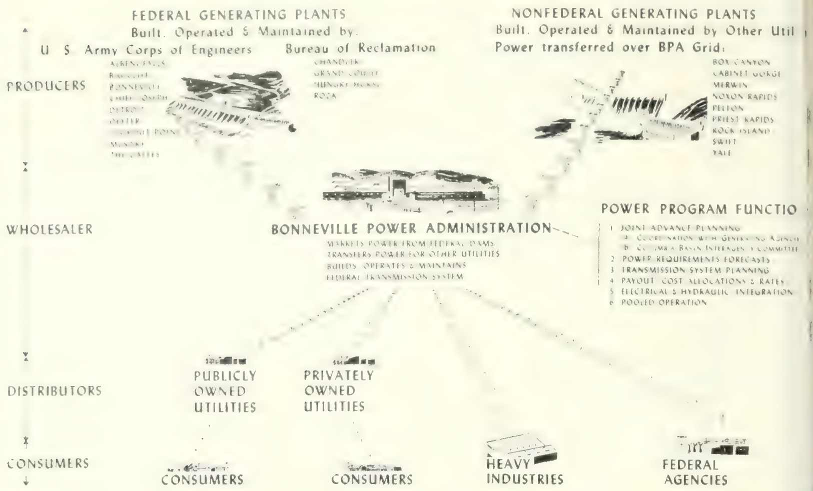
[1] CE—Corps of Engineers; BR—Bureau of Reclamation.

[2] Nameplate rating.

[3] Millions of kilowatt-hours.

Functions of Bonneville Power Administration


FEDERAL GENERATING PLANTS
Built, Operated & Maintained by:
U. S. Army Corps of Engineers
Bureau of Reclamation
ALBENI FALLS
BIG CLIFF
BONNEVILLE
CHIEF JOSEPH
DETROIT
DEXTER
LOOKOUT POINT
McNARY
THE DALLES
CHANDLER
GRAND COULEE
HUNGRY HORSE
ROZA
NONFEDERAL GENERATING PLANTS
Built, Operated & Maintained by Other Util
Power transferred over BPA Grid:
BOX CANYON
CABINET GORGE
MERWIN
NOXON RAPIDS
PELTON
PRIEST RAPIDS
ROCK ISLAND
SWIFT
YALE
PRODUCERS
WHOLESALER
BONNEVILLE POWER ADMINISTRATION
MARKETS POWER FROM FEDERAL DAMS
TRANSFERS POWER FOR OTHER UTILITIES
BUILDS, OPERATES & MAINTAINS
FEDERAL TRANSMISSION SYSTEM
POWER PROGRAM FUNCTIO
1 JOINT ADVANCE PLANNING
a Coordination with Generating Agenci
b Columbia Basin Interagency Committee
2 POWER REQUIREMENTS FORECASTS
3 TRANSMISSION SYSTEM PLANNING
4 PAYOUT, COST ALLOCATIONS & RATES
5 ELECTRICAL & HYDRAULIC INTEGRATION
6 POOLED OPERATION
DISTRIBUTORS
PUBLICLY OWNED UTILITIES
PRIVATELY OWNED UTILITIES
CONSUMERS
CONSUMERS
CONSUMERS
HEAVY INDUSTRIES
FEDERAL AGENCIES

All generation and storage capacity under Federal construct will be in service by June 1968 under the present schedule. Ser dates for the other authorized projects are not yet scheduled.

## *Non-Federal Projects*

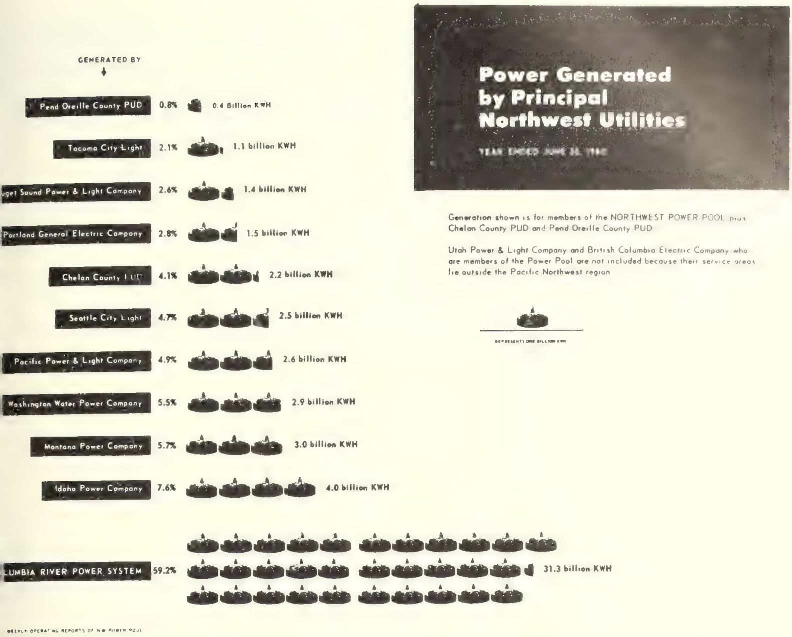
Addition of 825,250 kilowatts of nameplate rating by non-Fed utilities increased the generating capacity of non-Federal resour in the area served by the Bonneville Power Administration to a t of 3,644,580 kilowatts.

Future additions under construction or licensed for construction non-Federal utilities would add 2,464,600 kilowatts to the ar resources.

## *Northwest Power Pool*

Generation by the principal electric utility systems of the Pac Northwest during the fiscal year 1960 is shown in the accompany chart.

With the exception of Chelan County and Pend Oreille Cou Public Utility Districts, all utilities listed are members of the Nor west Power Pool. These two are included because they provide s stantial amounts of generation to the pool. The Utah Power Light Co. and the British Columbia Electric Co. are members of pool but are not included as their major service areas are outside region.



Power Generated by Principal Northwest Utilities

YEAR ENDED JUNE 30, 1960

Generation shown is for members of the NORTHWEST POWER POOL plus Chelan County PUD and Pend Oreille County PUD

Utah Power & Light Company and British Columbia Electric Company who are members of the Power Pool are not included because their service areas lie outside the Pacific Northwest region

WEEKLY OPERATING REPORTS OF NW POWER POOL

total of 59.2 percent of the energy generated by the major utili- of the region was provided by the U.S. Columbia River Power em. In addition to its other load, Bonneville Power Adminis- on provided 8.4 billion kilowatt-hours of energy to meet the net irements of eight other pool utilities.

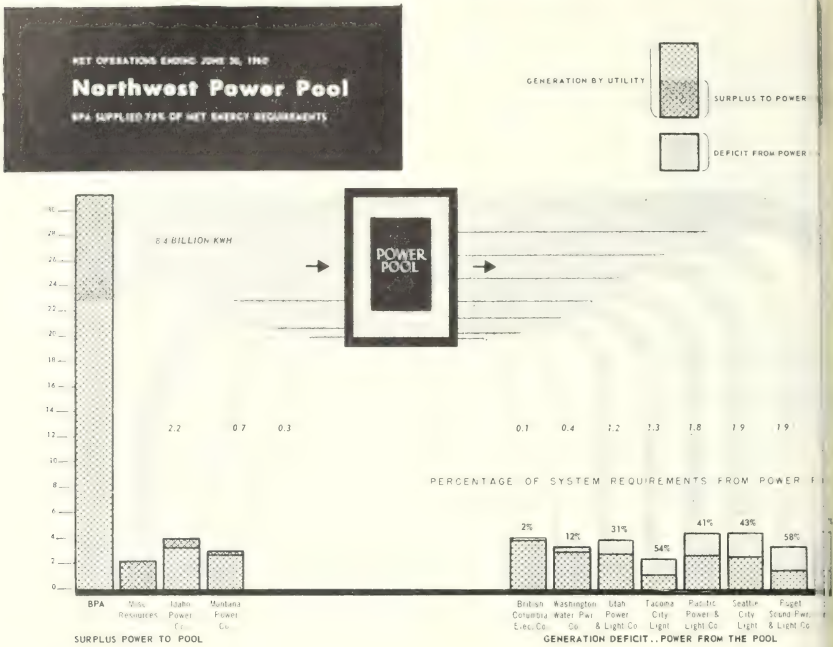
nneville Power Administration's electric energy account for fiscal 1960 is shown in table 2.

## *nsmission Network*

nneville Power Administration, as part of its marketing func- is responsible for construction, operation, and maintenance of smission facilities to transmit the power to the region's load cen- The administration's transmission grid at the end of the fiscal consisted of 8,028 circuit miles of high voltage transmission and 201 substations.

## *trical Coordination and Integration*

nneville Power Administration's high voltage transmission grid s as the "backbone" for all interconnected utilities of the Pacific hwest. The administration's transmission network had 424 ts of connection as of June 30, 1960, almost double the 256 con- ons of 10 years ago. These include interconnections with all the cipal utilities having generating facilities in the region.

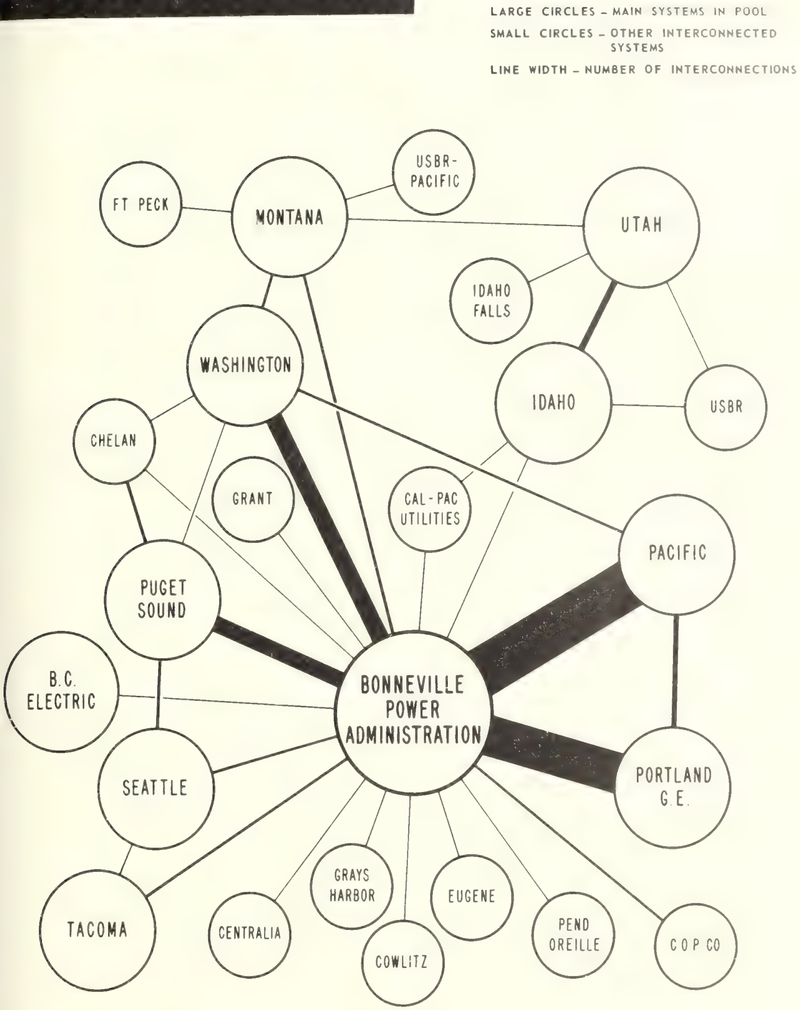


An expanded "wheeling" program instituted in 1954 has m
possible integration and coordination of Columbia River basin g
erating and transmission facilities. The program makes possible
only integration of all plants contributing to the Northwest Po
Pool, but effects substantial economies in power transmission and
many cases makes feasible construction of non-Federal projects
distant from load centers.

TABLE 2.—*Electric energy account for fiscal year 1960*

| | |
|---|---|
| Energy received (millions of kilowatt-hours): | |
| Energy generated for BPA: | |
| Bureau of Reclamation | 12, |
| Corps of Engineers | 18, |
| Power interchanged in | 6, |
| Total received | 37, |
| Energy delivered (millions of kilowatt-hours): | |
| Sales | 29, |
| Power interchanged out | 6, |
| Used by Administration | |
| Total delivered | 35, |
| Energy losses in transmission and transformation | 1, |
| Losses in percent of total received—percent | |
| Maximum demand on Federal plants (kilowatts) March 3, 1960, 5–6 p.m. PST | 4,928, |
| Load factor, total generated for BPA, percent | 7 |

## Interconnected Utilities of the Northwest Power Pool



## owth of Wheeling Program

The wheeling program under which the Federal transmission grid made available for transmission of non-Federal power generation area load centers increased by 40.3 percent in fiscal year 1960 over previous year. The Bonneville Power Administration wheeled or nsferred for other utilities 6.7 billion kilowatt-hours of energy as mpared to 4.8 billion kilowatt-hours the previous year. During the same period other utilities wheeled or transferred 2.1 billion ki- watt-hours of energy for the Government.

Power is being delivered under long-term firm capacity contr from the Pelton project of the Portland General Electric Co., the B Canyon project of the Pend Oreille Public Utility District and Priest Rapids project of the Grant County Public Utility Distri Excess capacity contracts cover power from the Swift project of Pacific Power and Light Co., the Rock Island project of the Che County Public Utility District, the Priest Rapids project of Grant County Public Utility District, and into the region from California Oregon Power Co. and the Idaho Power Co.

## *Construction Program*

Major transmission additions completed during the year in Ore included a 230,000-volt line between Albany and Toledo, to sup additional industrial power for the Toledo area and a 115,000-v line between Finn Rock and Leaburg near Eugene, to serve the lu bering and resort area of the upper McKenzie Valley. In the C lumbia Basin Reclamation area in Washington, a 115,000-volt l was added between Sand Dunes and Larson, near Moses Lake a a 33,000-kilovolt-ampere substation at Larson.

Construction under way at the close of the fiscal year include 345,000-volt, 128-mile line from Chelan County Public Utility Di trict's Rocky Reach hydroelectric project to Maple Valley, n Seattle, Wash., to bring the output of the project to western Wa ington; a 23-mile, 230,000-volt line from Rocky Reach hydroelect project to Columbia, near Wenatchee, Wash.; a 125-mile, 287,0 volt line between Tacoma, Wash., and Columbia; an 81-mile, 345,0 volt line with initial 230,000-volt operation, between Big Eddy su station, The Dalles Dam, and McLoughlin substation, near Oreg City, Oreg., owned by Portland General Electric Co.; a 130-m 115,000-volt line between Redmond and Burns, Oreg.; and a 40-m 115,000-volt line between DeMoss and Fossil, Oreg.

## *Energy Sales of 29.7 Billion Kwh*

During fiscal year 1960, BPA sold 29.7 billion kilowatt-hours electric energy for about $69,000,000, an average of 2.32 mills p kilowatt-hour. Energy sales increased 3.6 percent over the previo year.

Percentage distribution of energy sales by classes of customers for al year 1960 follows:

| | Number of customers June 1960 | Energy sale by percent of total |
|---|---|---|
| Publicly owned utilities | 79 | 35. 7 |
| Privately owned utilities | 9 | 18. 8 |
| Aluminum industry | 9 | 30. 1 |
| Other industries and Federal agencies | 19 | 15. 4 |
| Total | 116 | 100. 0 |

## *blic Utility Sales Increase*

Sales to publicly owned utilities continued to increase at a higher e than sales to other classes of customers. Between 1950 and 1960, les to publicly owned utilities increased 273 percent, while total les increased 128 percent.

ncreased non-Federal generation, most of which was transferred r the Bonneville Power Administration transmission system, re- lted in reduction in BPA sales to privately owned utilities, and to tes of Seattle and Tacoma, Wash.

The aluminum companies increased their purchases of firm power ing 1960 by about 60,000 kilowatts, which is a 10 percent increase r 1959. Sale of interruptible power to aluminum plants decreased 7 percent from the previous year, with most of the decrease shown those plants increasing their purchase of firm power. Sales of terruptible power to the aluminum industry have decreased by ,000 kilowatts since 1956.

n increase in energy deliveries to other industries and Federal ncies results from their increased operations during the 1959 fiscal r. The energy consumption level in June, 1960 was about equal June, 1959.

## *used Capacity*

Bonneville's industrial customers have, in the aggregate, an esti- ted capacity to use power at the rate of approximately 1,800,000 lowatts. As of June 30, 1960, their power purchases from the vernment and from other sources totaled 1,417,000 kilowatts; leav- g idle plant capacity of about 400,000 kilowatts. Firm deliveries m the Government were 1,102,000, interruptible deliveries were ,000 kilowatts, and 135,000 kilowatts were purchased from non- deral sources.

Detail of energy deliveries by classes of customers for 1960 c pared with 1959 are shown in table 3.

TABLE 3.—*Sales of electric energy by classes of customers*

| | Fiscal year 1960 | | Fiscal year 1959 | | |
|---|---|---|---|---|---|
| | Millions of kilowatt-hours | Mills per kilowatt-hour | Millions of kilowatt-hours | Mills per kilowatt-hour | Perc Incre |
| Publicly owned utilities: [1] | | | | | |
| Firm | 10,455 | 2.71 | 9,186 | 2.75 | |
| Nonfirm | 134 | 2.50 | 299 | 2.50 | - |
| Total | 10,589 | 2.70 | 9,485 | 2.74 | |
| Privately owned utilities: | | | | | |
| Firm | 4,522 | 2.15 | 5,657 | 2.13 | - |
| Nonfirm | 1,068 | 2.50 | 897 | 2.50 | |
| Total | 5,590 | 2.22 | 6,554 | 2.18 | - |
| Aluminum plants: | | | | | |
| Firm | 7,761 | 1.98 | 7,039 | 2.02 | |
| Nonfirm | 1,167 | 1.82 | 1,256 | 1.92 | |
| Total | 8,928 | 1.96 | 8,295 | 2.00 | |
| Other industries: [2] | | | | | |
| Firm | 4,053 | 2.25 | 3,847 | 2.27 | |
| Nonfirm | 523 | 2.21 | 483 | 2.24 | |
| Total | 4,576 | 2.24 | 4,330 | 2.27 | |
| Total energy: | | | | | |
| Firm | 26,791 | 2.33 | 25,729 | 2.34 | |
| Nonfirm | 2,892 | 2.17 | 2,935 | 2.21 | |
| Total | 29,683 | 2.32 | 28,664 | 2.33 | |

[1] Data for city of Richland billed to the Atomic Energy Commission. July 1959–October 1960 has shifted from Federal agencies to publicly owned utilities for comparative data.

[2] Including Federal agencies.

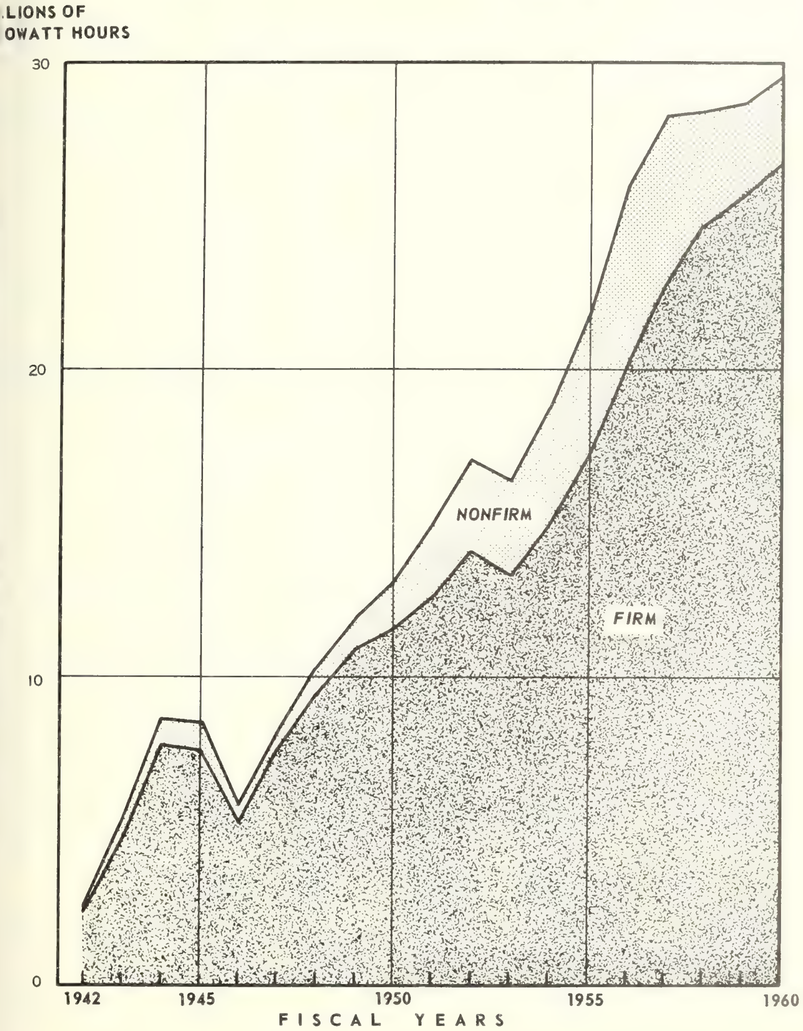
## *Power for Industrial Expansion*

As a result of the favorable power situation and unprecedented pansion of hydroelectric generation in the Pacific Northwest, Bon ville Power Administration was able to offer for sale last May a bl of 150,000 kilowatts of firm power for industrial expansion. Conc rently, a new category of high priority secondary power called " dustrial power," limited to 400,000 kilowatts was offered.

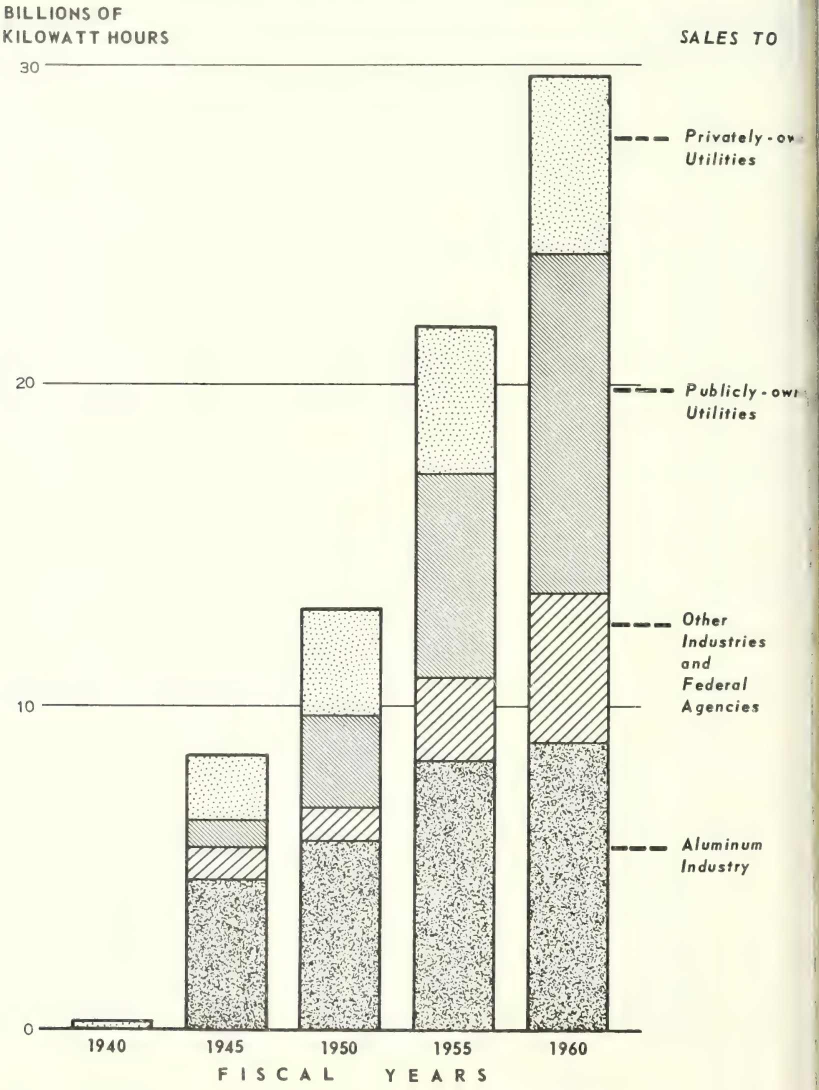
Contract negotiations in progress at the end of the fiscal year in cate the new power offer will result in the establishment of two n electroprocess industries in the region and plant expansion of t existing industries with an estimated private investment of ab $140 million in new plant equipment. Peak requirements of the fo plants are expected to total 177,000 kilowatts of firm and 222,0 kilowatts of secondary power.

The new industrial sales are expected to increase Bonneville Pow Administration revenues by about $6,500,000 a year.

# Firm and Nonfirm Sales of Electric Energy



# Sales of Electric Energy by Class of Customer



## ver Rates

onneville Power Administration delivered about 69 percent of its
gy sales at an average cost of 2.15 mills per kilowatt-hour to in-
ries, and to utilities having substantial generating facilities.
summary of energy sales for fiscal year 1960, classified by rate
dules is shown in table 4.

ABLE 4.—*Sales of electric energy by rate schedules fiscal year 1960*

| Rate schedule | Energy | | | Mills per kilowatt hour |
|---|---|---|---|---|
| | Millions of kilowatt hours | Percent of total | Percent change from 1959 | |
| | 20,519 | 69.1 | −0.3 | 2.15 |
| | 56 | 0.2 | −8.3 | 4.54 |
| | 2,157 | 7.3 | 21.6 | 1.68 |
| | 5,641 | 19.0 | 14.0 | 3.10 |
| | 1,296 | 4.4 | −0.1 | 2.50 |
| eating | 14 | (2) | (3) | 1.00 |
| | 29,683 | 100.0 | 3.6 | 2.32 |

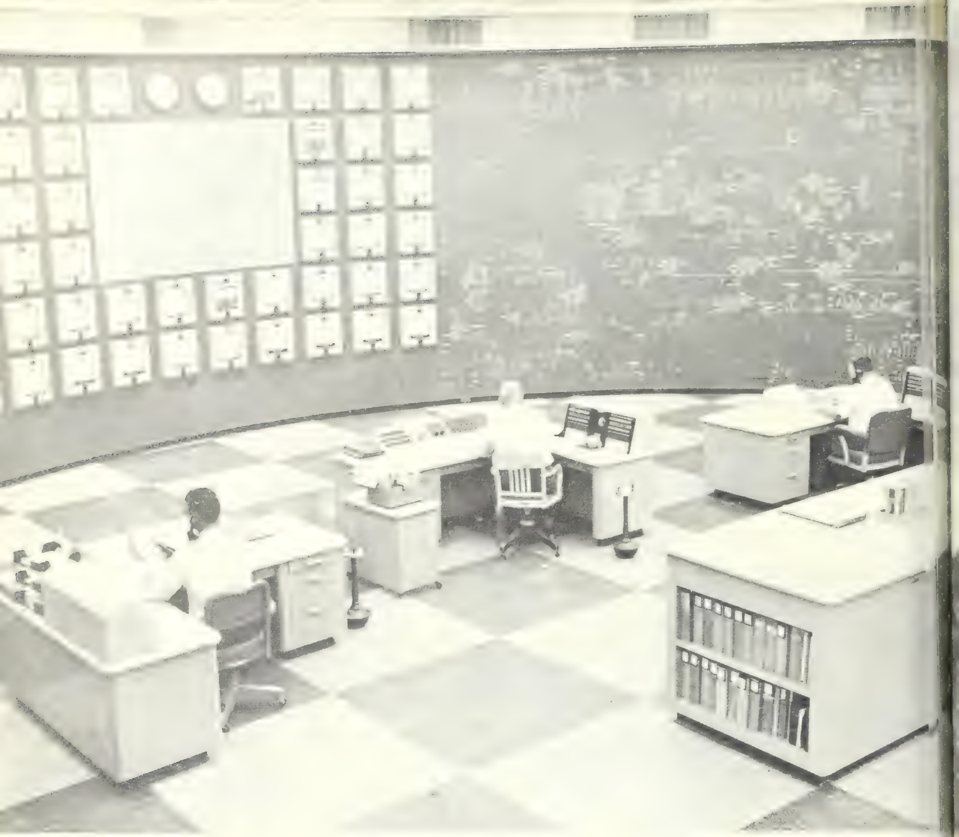
features of rate schedules:
1 Kilowatt-year for transmission system firm power.
1 Demand-energy rate for firm power.
1 Kilowatt-year rate for at-site firm power.
1 Demand-energy rate for firm power for resale to ultimate consumers.
3 Energy rate for dump, emergency, breakdown or experimental service.
ice heating Special space heating rate applicable in vicinity of Grand Coulee plant.
udes interruptible industrial sales.
s than 0.05 percent.
ial service under this rate in September 1959.

## c Rate Unchanged

ecial studies of the Bonneville Power Administration's whole-
rate structure and payout schedules resulted in continuance of
present basic wholesale rate of $17.50 per kilowatt-year for an-
r 5-year period effective December 20, 1959, with approval by the
eral Power Commission. Bonneville Power Administration has
ntained the same basic rate level since beginning of operations
938.

## ncial Results

inancial results of operations for the Bonneville Power Admin-
ation for fiscal year 1960 compared with fiscal year 1959 are shown
ummary form in tables 5, 6 and 7. These data are necessarily
iminary inasmuch as the annual audit by the General Accounting
e was not complete at the time of the preparation of these state-
ts. However, it is anticipated that final figures will not differ
erially from those now available.

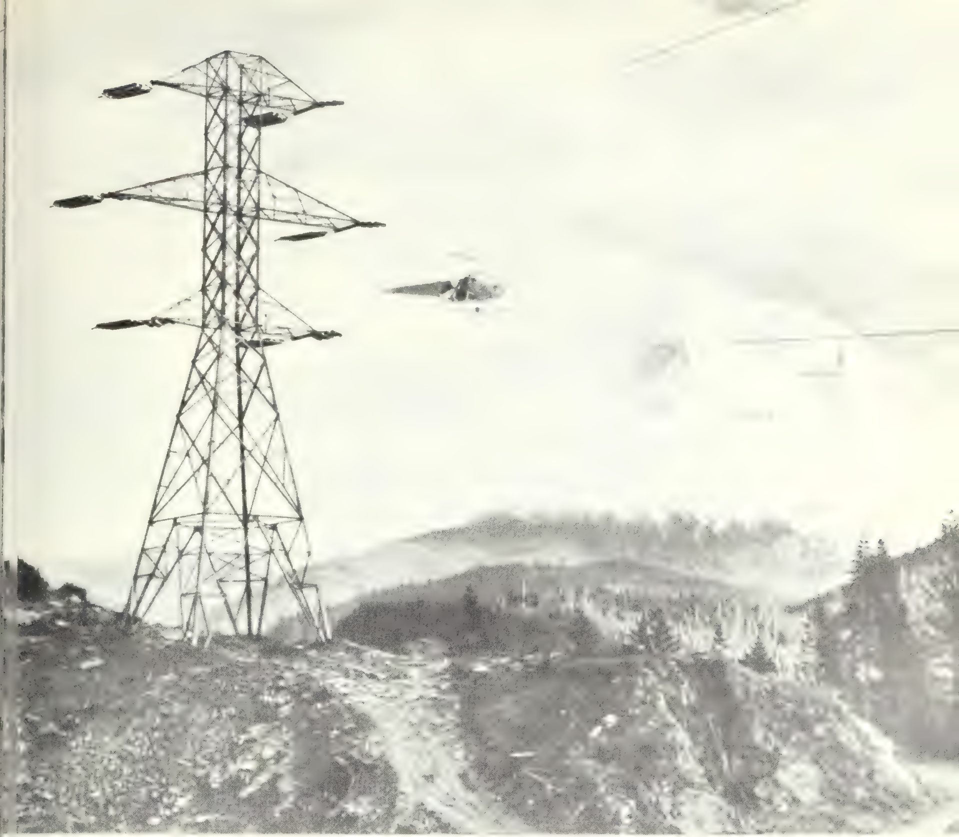


*Bonneville Power Administration's regional power dispatching center, Portl provides almost instantaneous control over the generating and transmission fa ties of the U.S. Columbia River Power System, including Oregon, Washing northern Idaho and Montana west of the Continental Divide. Two dispatc are on duty 24 hours a day with an outage dispatcher added during the dayl shift.*

The financial information is presented on two bases: (1) an accr cost accounting basis in accordance with the uniform system of counts prescribed by the Federal Power Commission for elect utilities, and (2) a payout basis.

The principal differences between these methods are: (1) pay is based on cash receipts rather than accrued revenues but it does clude accrued expenses with the exception of noncash exchange count items; (2) in lieu of depreciation expense payout substitu amortization of the capital investment over periods of time shor than the estimated service lives used in cost accounting for termining depreciation expense; and (3) payout provides for use power revenue receipts to assist in the repayment of irrigation co whereas cost accounting does not include such payments as pov costs.

It should be noted that the payout requirements govern the s tem rate level because cash receipts must be adequate to cover t



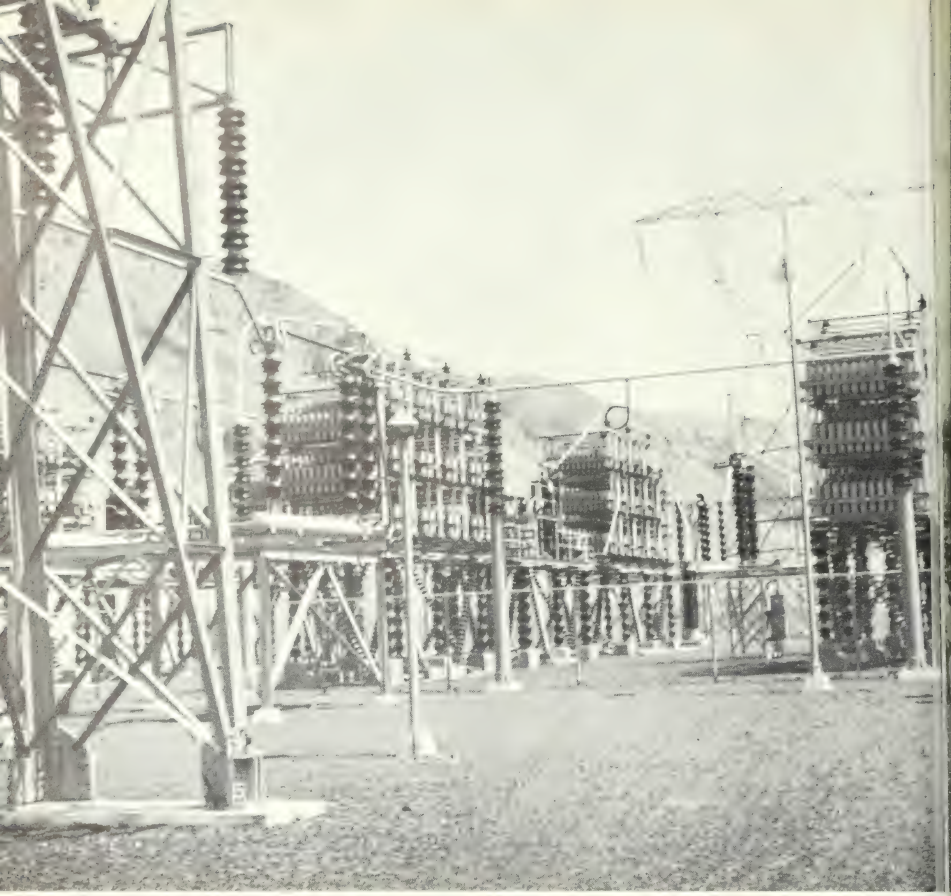
*Bonneville Power Administration helicopter patrols one of the double circuit*
*l transmission lines, bringing power down the Columbia gorge from the Mid-*
*umbia plants of the U.S. Columbia River Power System.*

tal payout requirements, which are assigned to be repaid from
wer operations, for all of the projects in the U.S. Columbia River
wer System.

## *tement of Revenues and Expenses*

A comparative statement of the revenues and expenses of the
nneville Power Administration on a cost accounting basis for
al years 1959 and 1960 is presented in table 5. Energy sales in-
ased by $2,084,506 or 3.12 percent during the year. Other electric
enue increased by $439,622, or 27.23 percent, the large increase
ng due to the increase in wheeling energy from non-Federal proj-
s to load centers. Total operating revenue reached $70,998,219
1960, an increase for the year of $2,524,128, or 3.69 percent.

After providing for all expenses of operation, maintenance and in-
est and the allocations of revenues to the generating projects, net
venues in fiscal year 1960 of $3,447,792 were available for repayment
f the capital investment in the transmission system. Such net rev-



*Installation of the first 345,000-volt-series capacitor bank in the nation was c*
*pleted during fiscal year 1960 on Bonneville Power Administration's McNary-J.*
*Ross 345,000-volt transmission line at John Day substation near the site of J*
*Day dam. The capacitor bank will assure optimum power transmission charac*
*istics for the 175-mile line.*

enues were $1,115,616 less than the amount available in 1959. O
cumulative basis through June 30, 1960, net revenues available
repayment of the transmission system capital investment were $12
276,474 and left a surplus of $15,367,767 after providing for deprec
tion and amortization.

Revenues allocated to the Federal generating projects that su
plied power to the Bonneville Power Administration totaled $4
078,000 in 1960, an increase of $2,336,000 over 1959. These allo
tions are independent of the amount of energy generated but
geared to the schedules necessary to repay the costs allocated to po
er. Such costs include operating expenses, interest on and amorti
tion of the capital investment at all of the generating projects, p
financial assistance to irrigation repayment in the case of the Colu
bia basin and the Yakima projects.

E 5.—*Bonneville Power Administration: Comparative statement of revenues and expenses, fiscal years 1959 and 1960 (preliminary)*

[Cost Accounting Basis]

| | Fiscal year 1959[1] | Fiscal year 1960 | Increase or decrease | Total to June 30, 1960 |
|---|---|---|---|---|
| ting revenue: | | | | |
| les of electric energy | $66,859,544 | $68,944,050 | $2,084,506 | $718,242,443 |
| ther electric revenue | 1,614,547 | 2,054,169 | 439,622 | 16,307,651 |
| Total operating revenue | 68,474,091 | 70,998,219 | 2,524,128 | 734,550,094 |
| evenues allocated to generating projects: | | | | |
| nneville dam | 2,300,000 | 2,100,000 | (200,000) | 65,825,430 |
| lumbia basin project | 12,800,000 | 12,800,000 | | 174,358,680 |
| ungry Horse | 3,816,000 | 3,833,000 | 17,000 | 27,240,210 |
| beni Falls | 1,400,000 | 1,400,000 | | 8,575,000 |
| cNary | 9,000,000 | 9,000,000 | | 63,910,000 |
| etroit-Big Cliff | 1,900,000 | 1,700,000 | (200,000) | 12,840,000 |
| okout Point-Dexter | 1,800,000 | 1,700,000 | (100,000) | 10,000,000 |
| hief Joseph | 6,700,000 | 6,500,000 | (200,000) | 24,150,000 |
| akima, Kennewick and Roza | 326,000 | 345,000 | 19,000 | 1,286,000 |
| he Dalles | 4,700,000 | 7,700,000 | 3,000,000 | 15,020,000 |
| Total revenues allocated to generation | 44,742,000 | 47,078,000 | 2,336,000 | 403,205,320 |
| Operating revenues allocated to Bonneville Power Administration | 23,732,091 | 23,920,219 | 188,128 | 331,344,774 |
| perating expenses: | | | | |
| rchased power | 597,557 | 652,314 | 54,757 | 9,507,857 |
| peration, maintenance, administration, etc. | 10,597,403 | 11,493,369 | 895,966 | 120,959,467 |
| Total operating expenses | 11,194,960 | 12,145,683 | 950,723 | 130,467,324 |
| nterest and other deductions: | | | | |
| terest on Federal investment | 8,365,765 | 8,708,916 | 343,151 | 81,820,371 |
| ss amount charged to construction | 291,056 | 391,595 | 100,539 | 7,703,404 |
| llaneous income deductions, net | (100,986) | 9,423 | 110,409 | 1,484,009 |
| Total interest and other deductions | 7,973,723 | 8,326,744 | 353,021 | 75,600,976 |
| evenues available for depreciation and rtization of Federal investment | 4,563,408 | 3,447,792 | (1,115,616) | 125,276,474 |
| lepreciation and amortization | 11,934,218 | 12,067,262 | 133,044 | 109,908,707 |
| Net revenues | (7,370,810) | (8,619,470) | (1,248,660) | 15,367,767 |

---

ta for fiscal year 1959 have been restated from the previously published figures to make the 1959 infor- n comparable to the data shown for fiscal year 1960 as the result of the reclassification of interchange nt credits adopted in fiscal year 1960. Formerly such transactions were included in the operating se accounts, but beginning with 1960 the transactions are shown as revenue from the sales of electric . Hence, energy sales for 1959 have been increased by $500,406 and operating expenses (purchased ) have been increased by a corresponding amount. The final net revenues are not affected. In year 1960 interchange credits of $1,023,219 have been included in the energy sales figure.

## *nparative Balance Sheet*

able 6 is a condensed statement of assets and liabilities on a cost ounting basis for the investment in Bonneville Power Administra- n as of June 30, 1959 and 1960. Electric transmission plant in serv- at the end of 1960 was nearly $451,000,000, an increase of more n $8,700,000 during the year. Construction work in progress at end of the year was approximately $27,700,000, an increase of e than $9,300,000. The total investment in electric transmission nt increased approximately $18,100,000.

he gross investment of the Federal Government in the Bonneville ver Administration transmission and marketing program increased roximately $41 million. These gross amounts include, in addition

to transmission capital investment, the amounts necessary for o
tion, maintenance and interest expenses. Funds returned to the T
ury by BPA after deducting amounts allocated to the generating
ects increased by more than $22,400,000, with the result that the un
investment owing to the Federal Treasury increased only $18,600
This increase is represented almost entirely by the increase in th
vestment in electric plant, with the remainder consisting of cas
hand and other miscellaneous assets.

TABLE 6.—*Bonneville Power Administration—condensed statement of asset
liabilities of June 30, 1959 and 1960 (Preliminary)*

[Cost Accounting Basis]

| | 1959 | 1960 | Increa (decre |
|---|---|---|---|
| ASSETS | | | |
| Electric plant—original cost: | | | |
| Electric plant in service | $442, 212, 176 | $450, 929, 591 | $8, 7 |
| Electric plant leased to others | 462, 571 | 445, 307 | ( |
| Construction work in progress | 18, 343, 373 | 27, 668, 725 | 9, 3 |
| Electric plant held for further use | 775, 691 | 869, 741 | |
| Other physical property | 73, 569 | 42, 771 | ( |
| Total electric plant | 461, 867, 380 | 479, 956, 135 | 18, 0 |
| Less reserve for depreciation | 86, 321, 176 | 96, 992, 049 | 10, 6 |
| Original cost less reserves | 375, 546, 204 | 382, 964, 086 | 7, 4 |
| Current assets: | | | |
| Unexpended funds | 16, 146, 758 | 20, 396, 529 | 4, 2 |
| Special deposits | 617, 472 | 692, 210 | 7 |
| Accounts receivable: | | | |
| Customers | 9, 995, 078 | 10, 390, 953 | 3 |
| Others | 806, 938 | 484, 492 | (32 |
| Materials and supplies | 5, 819, 435 | 5, 058, 948 | (7 |
| Total current assets | 33, 385, 681 | 37, 023, 132 | 3, 6 |
| Other assets and deferred charges | 3, 457, 494 | 1, 881, 808 | (1, 57 |
| Total assets | 412, 389, 379 | 421, 869, 026 | 9, 47 |
| LIABILITIES | | | |
| Investment of U.S. Government: | | | |
| Congressional appropriations | 574, 903, 234 | 606, 464, 620 | 31, 5 |
| Transfers [1] | 17, 391, 902 | 18, 114, 858 | 72 |
| Interest on Federal investment: | | | |
| Charged to operations | 65, 799, 646 | 74, 116, 967 | 8, 31 |
| Charged to construction | 7, 311, 809 | 7, 701, 768 | 38 |
| Continuing fund | 1, 833, 035 | 1, 833, 035 | |
| Gross investment | 667, 239, 626 | 708, 231, 248 | 40, 9 |
| Less: funds returned | 287, 512, 126 | 309, 865, 070 | 22, 35 |
| Net investment | 379, 727, 500 | 398, 366, 178 | 18, 63 |
| Accumulated net revenues: | | | |
| Balance June 30, 1958 and 1959 | 31, 358, 047 | 23, 987, 237 | (7, 37 |
| Net revenue for year | (7, 370, 810) | (8, 619, 470) | (1, 24 |
| Balance June 30, 1959 and 1960 | 23, 987, 237 | 15, 367, 767 | (8, 61 |
| Total investment | 403, 714, 737 | 413, 733, 945 | 10, 01 |
| Current and accrued liabilities: | | | |
| Accounts payable | 5, 203, 768 | 5, 404, 337 | 20 |
| Employees' accrued leave | 2, 275, 195 | 2, 261, 177 | (1 |
| Total | 7, 478, 963 | 7, 665, 514 | 18 |
| Deferred credits | 1, 195, 679 | 469, 567 | (72 |
| Total liabilities | 412, 389, 379 | 421, 869, 026 | 9, 47 |

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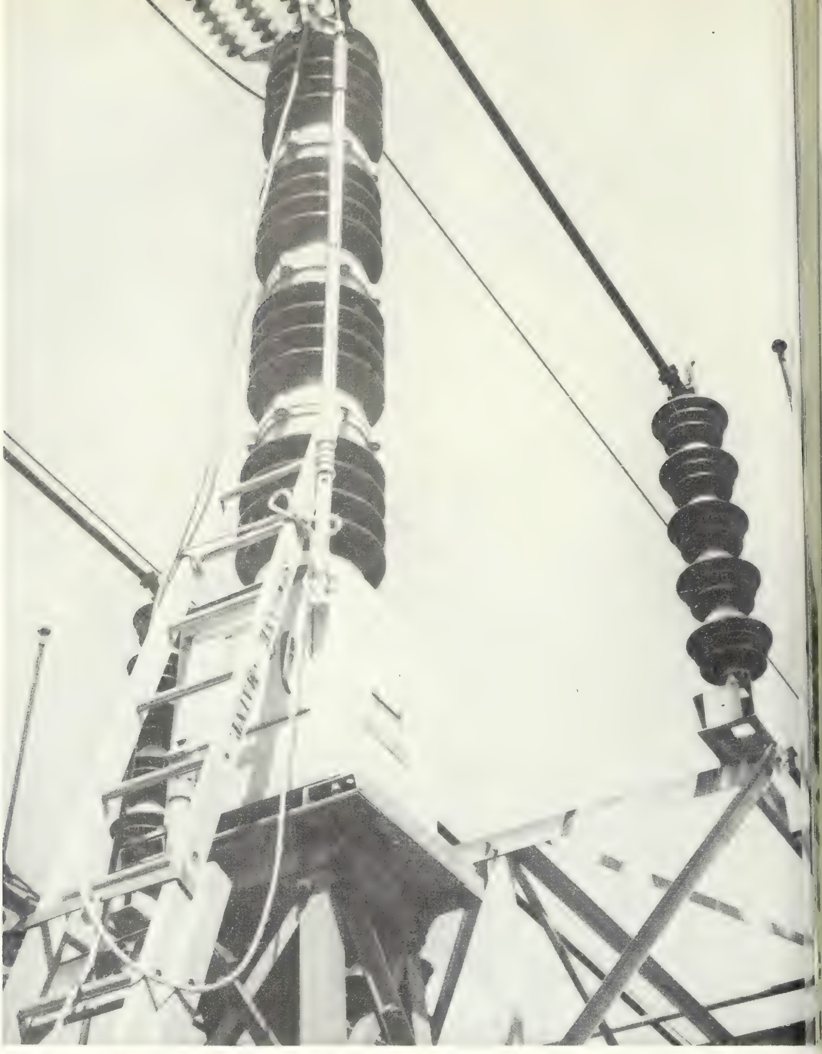
[1] Consists of goods and services furnished without charge by other Federal agencies less such item
nished to other Federal agencies by BPA.

*construction crew, with the aid of a giant crane, erects a single circuit steel ver for Bonneville Power Administration's Tacoma-Grand Coulee 287,000-volt nsmission line in the rugged Stampede Pass section of the Cascade range.*



*A ground lead "hot stick" is connected to the line side of a wave trap on the*
*Springs terminal at Bell substation for the safety of workers on the new tern*
*facilities.*

## *Repayment of Federal Investment*

The amount of the Federal investment in the Bonneville Power
ministration transmission system and the status of repayment o
payout basis as of June 30, 1960, are shown in table 7. From
inception of operations to June 30, 1960, the Bonneville Power
ministration has returned cash receipts to the Treasury in the agg
gate amount of $713,070,391. Of this total, $403,205,320 has b
allocated to the generating projects and $309,865,071 to the transm
sion system.

These receipts have reimbursed the Federal Treasury in full
Bonneville Power Administration's expenses of operation, mai
nance, marketing, administration, etc., totaling $110,826,179, and h

*Bonneville Power Administration testing crew checks out a fault locator and ase selector at one of BPA's large substations.*

BLE 7.—*Bonneville Power Administration—summary of Federal investment in transmission system and repayment as of June 30, 1960 (preliminary)*

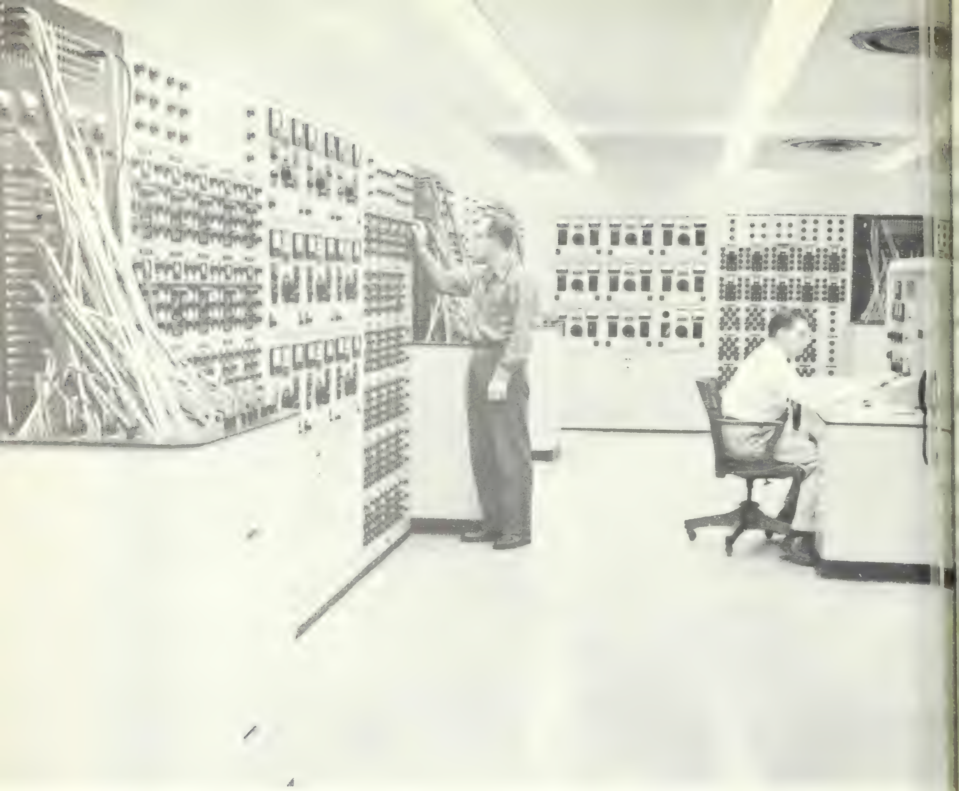
[Payout basis]

| | Gross investment | Repayments | Net investment |
|---|---|---|---|
| estment in current expenses: | | | |
| Operation, maintenance, etc. | $110, 826, 179 | $110, 826, 179 | |
| Interest | 74, 116, 967 | 74, 116, 967 | |
| Total current expenses | 184, 943, 146 | 184, 943, 146 | |
| estment in capital assets: | | | |
| Electric plant investment and other capital assets | 502. 773, 937 | [1] 124, 921, 925 | $377, 852, 012 |
| Unexpended appropriations | 20, 379, 457 | | 20, 379, 457 |
| Total capital investment | 523, 153, 394 | 124, 921, 925 | 398, 231, 469 |
| Total Federal investment | 708, 096, 540 | [2] 309, 865, 071 | 398, 231, 469 |

Consists of $89,068,000 scheduled amortization and $35,853,925 repaid in excess of scheduled requirements. total repayment, $124,921,925 equals 24.8 percent of the invested capital of $502,773,937.

| | |
|---|---|
| Total cash receipts covered into the U.S. Treasury by BPA to June 30, 1960 | $713, 070, 391 |
| Less amounts allocated to generating projects | 403, 205, 320 |
| Cash receipts allocated to Bonneville Power Administration | 309, 865, 071 |

)



*Bonneville Power Administration's A–C network analyzer, largest west of*
*Rockies, is used to work out system problems of coordination and integration*
*both Bonneville and interconnected systems, as well as for planning transmiss*
*facilities that will be required in the next 10 to 25 years to meet the power ne*
*of the region.*

repaid in full interest on the transmission investment in the amou
of $74,116,967 with the balance of $124,921,925 applied to repayme
of the capital investment. This capital repayment exceeded schedul
amortization requirements by $35,853,925 and represented repa
ments of 24.8 percent of the total capital investment of $502,773,9

## *Power Development Trends*

There were several important developments in the power field du
ing fiscal year 1960 that could have a tremendous impact on both t
power resources and power operations of the U.S. Columbia Riv
Power System.

One of these important events was an announcement by the Inte
national Joint Commission of a general policy statement as a gui
for development of upper Columbia river storage projects. The r
cently established negotiating committee is currently proceeding wi
discussions between Canada and the United States. The U.S. neg
tiating team is made up of representatives of the Department of I
terior, the Corps of Engineers and the State Department.

he potential hydroelectric generation resulting from downstream efits of the proposed upper Columbia storage projects could make bstantial contribution to the generating capacity of the Columbia r power system. Completion during the next decade of one or e of these projects would affect many phases of Columbia river er operations and resource planning.

### *mic Energy*

nother important event was start of construction on a dual purpose tor at the Hanford Atomic Energy Works. This could be the runner of the first large scale generation of electric energy by nic fission in the Pacific Northwest.

he Federal Power Commission, with the assistance of BPA, has pleted its study of the feasibility of installing steam operated eration facilities in connection with the reactor. The most feasible tor design under assumptions of the study would produce 654,000 watts during the initial 10-year period of operations, and 756,000 watts over the 25 years following.

### *ifornia Intertie*

onneville Power Administration in cooperation with the Depart- nt's Bureau of Reclamation and in consultation with interested util- s of the Pacific Northwest and California, completed a study of a posed intertie between the U.S. Columbia River Power System and thern California.

he study was made in response to a resolution of the Senate Com- tee on Interior and Insular Affairs adopted May 19, 1959, and was mitted to the Committee on February 17, 1960. The purpose of study was to determine the extent of a potential market for sub- ntial blocks of secondary power currently surplus to the needs of Pacific Northwest. The potential market for the power involves isplacement of steam generation in northern California, when such plus power is available from the Pacific Northwest.

egotiations relative to a proposed sale of surplus energy to the ific Gas and Electric Co. were suspended at the request of the ate Committee pending conclusion of an independent study spon- ed by the State of California of an extra high voltage "common rier" type of interconnection. The committee desired to consider islation insuring that the construction of an intertie would not rive power consumers of the Pacific Northwest of power produced he region.

# *Southwestern Power Administration*

Douglas G. Wright, *Administrator*

★ ★ ★

GROSS REVENUES of the Department of the Interior's Sou western Power Administration for fiscal year 1960 were $15,01 588.74, representing an increase of $479,538.86, or 3.3 percent over gross revenue for fiscal year 1959.

Since fiscal year 1958, the year Southwestern Power Administ tion's adjusted rates became effective, the revenue has increased. D ing the same period operating expense has increased. A continui effort is being made to obtain a more stable relationship betw expense and revenue.

During fiscal year 1960, private utilities accounted for 32 perc of the revenue dollar, electric cooperatives 57 percent, municipalit 9 percent, and Public Authorities 2 percent, as compared to fis year 1951 when the private utilities accounted for 82 percent, elect cooperatives 16 percent, municipalities 2 percent, and Public Autho ties 0 percent.

Table 1 presents a source and application of funds statement as June 30, 1959, and 1960.

TABLE 1.—*Southwestern Power Administration, Source and Application of Fun*

| Funds provided: | *June 30, 1959* | *June 30, 1960* |
|---|---|---|
| Congressional Appropriations (net) | $37, 932, 662. 37 | $39, 910, 976. |
| Transfer of cost or property to or from other Government agencies (net) | 497, 029. 70 | 624, 052. 2 |
| Gross operating revenue and other income | 70, 070, 270. 39 | 85, 083, 374. |
| Total funds provided | 108, 499, 962. 46 | 125, 618, 402. |

*thwestern Power Administration facilities, Springfield, Mo., the hub of Interior's ver Marketing System, graphically portray the continuing progress toward inte- tion of all sources of power in the Southwest region. This substation, with ciated switching yard, dispatching center, and communications equipment, inter- necting six 161-kilovolt and four 69-kilovolt lines providing electric service to omers of SPA, G&T cooperatives, municipalities, and private companies, will mately be the greatest point of power exchange in the area.*

ABLE 1.—*Southwestern Power Administration, Source and Application of Funds*—Continued

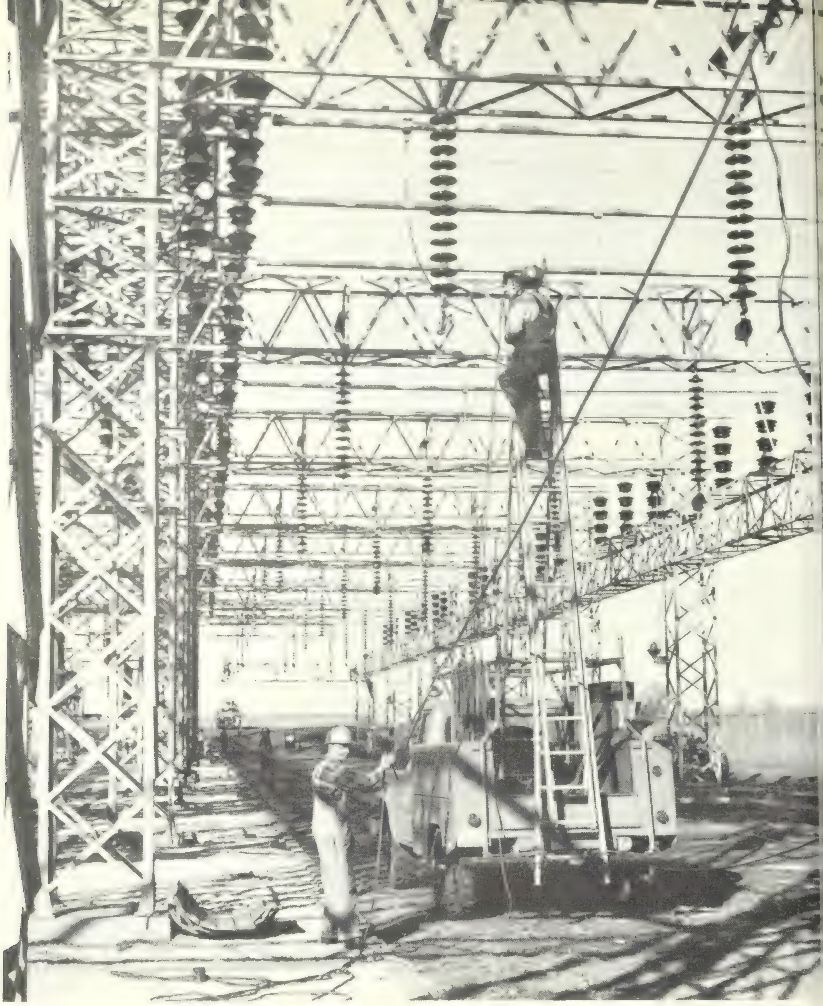
| | | |
|---|---|---|
| ds applied: | | |
| Returned to U.S. Treasury[1] | $26, 087, 682. 12 | $34, 106, 932. 77 |
| Accumulated operating expenses | 53, 236, 073. 35 | 66, 117, 878. 43 |
| Less: Nonfund depreciation and amortization expense | (4, 655, 490. 79) | (5, 367, 079. 08) |
| Electric plant | 25, 303, 960. 01 | 27, 107, 525. 85 |
| Special and trust funds | 8, 997, 948. 33 | 5, 746, 690. 86 |
| Cash | 3, 034, 067. 85 | 2, 469, 579. 73 |
| Accounts receivable | 1, 028, 949. 34 | 1, 114, 878. 86 |
| Non-utility property | 2, 056. 89 | 2, 474. 18 |
| Other current and accrued assets | 322, 370. 00 | 20. 00 |
| Material and supplies | 479, 759. 05 | 493, 987. 16 |
| Prepayments and advances | 1, 175. 00 | 1, 791. 65 |
| Deferred debits | (4, 365. 34) | (3, 642. 84) |
| Less: accrued and other nonfund items— | | |
| Accounts payable | (390, 637. 31) | (616, 766. 59) |
| Accrued payroll | (45, 213. 86) | (18, 512. 73) |
| Accrued leave | (102, 886. 77) | (112, 275. 01) |
| Contributions in aid of construction | (57, 486. 96) | (55, 920. 04) |
| Accrued interest on invested capital | (4, 737, 998. 45) | (5, 369, 160. 29) |
| Total funds applied | 108, 499, 962. 46 | 125, 618, 402. 91 |

otal funds referred to U.S. Treasury. No allocation of revenue has been made to the Corps of Engi-
to date.

he original cost investment in transmission facilities of South-
stern Power Administration amounted to $27,107,525.85, as of June
1960.

## *rketing*

uring fiscal year 1960, the electric power utilized by South-
stern Power Administration was obtained as follows: 1,672.0 mil-



*Southwestern Power Administration construction crew at work on new sec constructed at SPA substation, Springfield, Mo., to provide for increased capa resulting from the completion and interconnection of the department's Table R to Springfield 161-kilovolt transmission line placed in full commercial operat in fiscal year 1960.*

lion kilowatt-hours generated at Federal multiple-purpose proje operated by the Corps of Engineers, Department of the Army, 51 million kilowatt-hours obtained from thermal-electric generation other, public and private utilities, making a total of 2,183.6 milli kilowatt-hours. A total of 1,820.9 million kilowatt-hours (83.4 p cent was marketed as firm energy, 240 million kilowatt-hours (1 percent) was marketed as secondary and dump energy, 122.7 milli kilowatt-hours (5.6 percent) were system losses.

Deliveries to preference customers amounted to 1,528.3 million ki watt-hours, representing a 1.2-percent increase over the previous ye

Energy sales of Southwestern Power Administration for the fis year 1960 were 2,183.6 million kilowatt-hours, representing an i

ase of 137.1 million kilowatt-hours or 7.1 percent over the energy
s for the previous year.

The following table demonstrates the comparison of sales, in mil-
ns of kilowatt-hours, for fiscal years 1959 and 1960 by rate
edules.

| Rate schedules | Fiscal year 1959, millions of kilowatt hours | Fiscal year 1960, millions of kilowatt hours |
|---|---|---|
| P-1 | 0 | 20.9 |
| F-1 | 1,442.8 | 1,409.5 |
| EE | 26.7 | 55.2 |
| IC | 2.4 | .5 |
| Special contracts: | | |
| Firm | 391.5 | 390.5 |
| Secondary | 60.4 | 184.3 |
| Total sales | 1,923.8 | [1] 2,060.9 |

[1] Includes total secondary sales of 240 million kilowatt-hours, the sum of EE, IC, and special contracts secondary.

## *ansmission and Wheeling Arrangements*

Southwestern Power Administration has constructed transmission
ilities interconnecting six Federal multiple-purpose projects from
ich it markets electric power and energy. These facilities have
n interconnected with the systems of other public and private utili-
s so that Federal transmission facilities are minimized.

In order to serve preference customers at their load centers without
duplication of transmission facilities, Southwestern Power Ad-
istration has contractual agreements with several private utility
npanies and with rural electric generation and transmission coop-
tives to serve its customers from the transmission facilities of those
tric companies and cooperatives. The principal arrangements
bodied in these contractual agreements provide for service to
tomers of SPA from facilities of others.

## *ntracts*

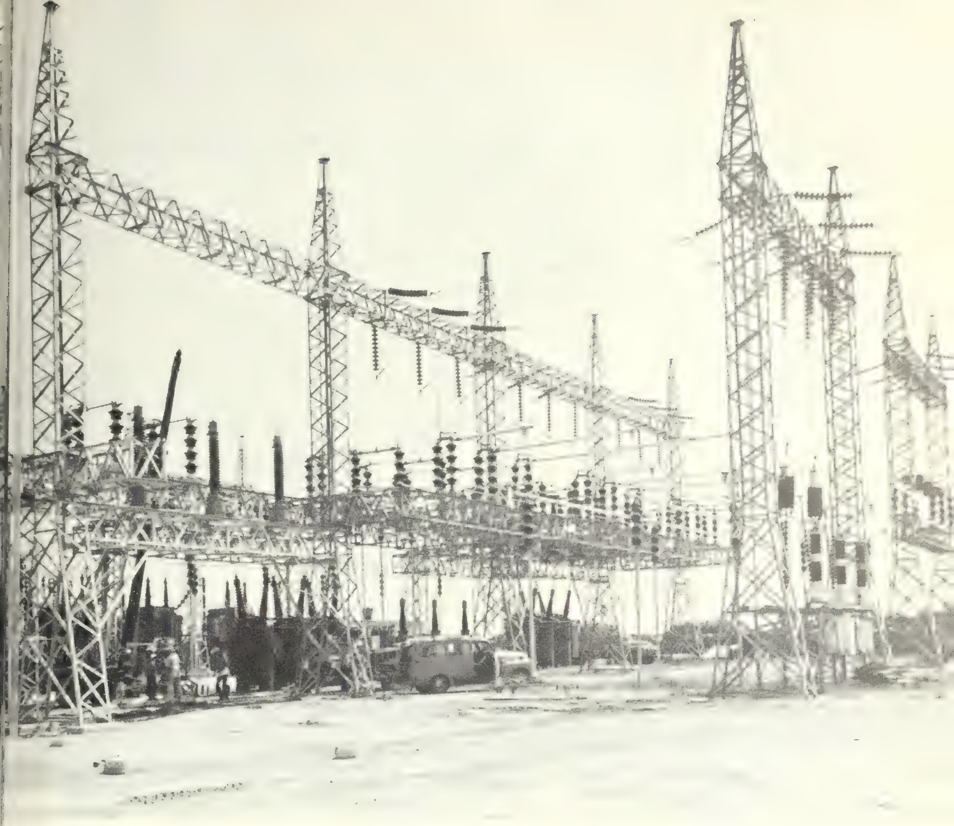
During the past 2 years, three new basic power contracts have been
npleted. Outstanding of these is a 25-year contract with Tex-La
ctric Cooperative, Inc., composed of cooperatives and municipali-
s in east Texas and Louisiana, which establishes a contractual ar-
gement for the sale of the entire 17,000 kilowatt ouput of Nar-
s Dam, with an additional 45,000 kilowatts from Southwestern
wer Administration's interconnected transmission system. The
tract becomes effective October 1, 1960.

*Breakers installed at Spa substation, Clinton, Mo. Extensive expansion of the installations was required to provide for interconnection of Kansas City Pow and Light Co. and Missouri Public Service Co., Kansas City, Mo.*

A contract, unanimously endorsed by preference customer group with the Kansas City Power and Light Co., also established an a rangement for the sale of hydroelectric peaking power. This ne contract establishes greater integration and utilization of the Federa and non-Federal power in the Southwest area and has resulted i the development of a market for large blocks of hydroelectric peak ing capacity on terms which will enable Southwestern Power Admir istration to make available by withdrawal any or all of such capacit as necessary to meet the requirements of preference type customer Also, a contract of this type was signed with the Missouri Publi Service Co., Kansas City, Mo.

A third contract was completed with the Oklahoma Gas and Elec tric Co. which provided for the sale of 1,200 hours of energy pe kilowatt of peaking capacity annually rather than the 1,800 hour per kilowatt of earlier contracts. This contract provides for (a reduction in the number of hours thus permitting Southwester Power Administration to market additional peaking capacity; an (b) an increase of kilowatt hours to be delivered during summe months when the demand for energy is greater in the Oklahoma area

These three new contractual arrangements will result in full utili zation of hydroelectric power generated from the Federal multiple purpose projects in the Southwest.



*struction crews at SPA substation, Weleetka, Okla., key point of interchange ower for Oklahoma and Texas customers of SPA. Extensive expansion of this tation with related facilities which will provide for doubling the power city—from 30,000 kilowatts to 60,000 kilowatts—is nearing completion.*

contract was completed and service was started in fiscal year 0 to one new preference customer—the city of Walters, Okla.—to ve the entire load of the city.

ntensive studies are now under way for effecting improvements present contractual arrangements with G&T cooperatives through- the Southwest. Contracts with the Western Farmers Electric operative, Anadarko, Okla., and with the N.W. Electric Power operative, Cameron, Mo., have been amended to provide for con- sion of part of the Government's commitments for firm power to king power, insofar as the loads will permit. This amendment l assure conservation of non-firm energy and make additional ounts of capacity useable as dependable peaking capacity from the leral system. The same contractual changes are now being nego- ed with the Central Electric Power Cooperative, Jefferson City, ., and with the Sho-Me Power Corporation, Marshfield, Mo.

onforming with the pattern already set with other G&T coopera- es, Southwestern Power Administration's contract with the KAMO ectric Cooperative, Vinita, Okla., has been amended to change the metering of the Government's power from the points of delive the points at which the Government interconnects with the K. system. The result is that KAMO is responsible for losses in it tem. As compensation for these loses, KAMO receives the bene the diversity in load within its own system.

## *Power Resources*

The installed capacity and capability in the hydroelectric and s electric plants in Southwestern Power Administration's inte nected system are shown in table 2. The installed capacity o interconnected Federal hydroelectric system was increased to 60 kilowatts when two units at the Table Rock project were plac operation on June 1, 1959.

TABLE 2.—*SPA total system capability*

| Project or plant | State | Installed capacity | Dependable capacity | Cap Ju 1 |
|---|---|---|---|---|
| Hydroelectric interconnected system: | | | | |
| Bull Shoals | Arkansas | 160,000 | 100,000 | |
| Denison | Oklahoma-Texas | 70,000 | 54,000 | |
| Fort Gibson | Oklahoma | 45,000 | 45,000 | |
| Norfork | Arkansas | 70,000 | 56,000 | |
| Table Rock | Missouri | 100,000 | 69,000 | |
| Tenkiller Ferry | Oklahoma | 34,000 | 28,000 | |
| Subtotals | | 479,000 | 352,000 | |
| Isolated plants: | | | | |
| Blakely Mountain | Arkansas | 75,000 | 75,000 | |
| Narrows | Arkansas | 17,000 | 14,000 | |
| Whitney | Texas | 30,000 | 24,000 | |
| Subtotals | | 122,000 | 113,000 | 1 |
| Total hydroelectric | | 601,000 | 465,000 | 6 |
| Steam: | | | | |
| Central Electric Power Coop | Missouri | 15,000 | 16,000 | |
| N.W. Electric Power Coop | Missouri | 40,000 | 42,000 | |
| Western Farmers Electric Coop | Oklahoma | 30,000 | 31,000 | |
| Total steam | | 85,000 | 89,000 | |
| Grand total | | 686,000 | 554,000 | 7 |

## *Energy Production*

Reservoir inflow for 9 months of the fiscal year 1960 was well ab normal with average flow for the year being about equal to medi The reservoir system storage was approximately 90 percent full at beginning of the fiscal year, and was 96 percent full on June 30, 1 The net generation for all Federal projects currently in operatio shown in table 3.

The total net hydro generation for 1960 was 1,726.6 million k watt-hours, which is the highest annual generation in Southwest er Administration since fiscal 1957. The net generation from the connected hydro system amounted to 1,471.2 million kilowatt- 's.

TABLE 3.—*SPA total system net hydro generation, fiscal years*

[Million kilowatt-hours]

| ear | Bull Shoals | Denison | Fort Gibson | Norfork | Tenkiller | Table Rock | Interconnected system | Narrows | Blakely Mountain[1] | Whitney | Grand total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| o June 950 | | 1,099.1 | | 1,066.7 | | | 2,165.8 | 3.1 | | | 2,168.9 |
| | | 254.6 | | 207.6 | | | 462.2 | 29.4 | | | 491.6 |
| | | 142.6 | | 338.9 | | | 481.5 | 42.5 | | | 524.0 |
| | 270.2 | 92.4 | 32.1 | 126.8 | | | 521.5 | 47.4 | | 0.4 | 569.3 |
| | 334.7 | 192.4 | 39.5 | 132.8 | 43.3 | | 742.7 | 17.8 | | 20.2 | 780.7 |
| | 241.1 | 140.2 | 70.7 | 23.7 | 54.6 | | 530.3 | 29.2 | | 30.1 | 589.6 |
| | 386.6 | 197.0 | 74.8 | 105.5 | 38.4 | | 802.3 | 21.2 | 66.1 | 48.6 | 938.2 |
| | 651.5 | 144.5 | 72.6 | 204.3 | 61.9 | | 1,134.8 | 39.8 | 219.3 | 71.2 | 1,465.1 |
| | 991.7 | 245.4 | 146.7 | 248.2 | 118.0 | | 1,750.0 | 45.8 | 177.0 | 83.2 | 2,056.0 |
| | 488.1 | 109.4 | 161.3 | 208.8 | 106.7 | 10.2 | 1,084.5 | 25.2 | 175.8 | 37.7 | 1,323.2 |
| | 418.6 | 266.9 | 271.8 | 174.4 | 126.7 | 212.8 | 1,471.2 | 30.4 | 155.6 | 69.4 | 1,726.6 |
| 1 | 3,782.5 | 2,884.5 | 869.5 | 2,837.7 | 549.6 | 223.0 | 11,146.8 | 331.8 | 793.8 | 360.8 | 12,633.2 |

neration delivered into Arkansas Power & Light Co. system. By contractual arrangements llion kilowatt-hours per year of firm energy is delivered into SPA system.

## *ım Power*

he amounts of energy generated by G&T steam electric plants for keting by Southwestern Power Administration during fiscal year ) are as follows:

| | *Kilowatt-hours* |
|---|---|
| ral Electric Power Cooperative (Chamois, Mo.) | 96,752,000 |
| . Electric Power Cooperative (Missouri City, Mo.) | 159,149,000 |
| tern Farmers Electric Cooperative (Anadarko, Okla.) | 130,350,300 |
| Total steam | 386,251,300 |

## *ıstruction*

onstruction during fiscal year 1960 saw (1) the completion of the nile 161-kilovolt transmission line connecting Table Rock project he Southwestern Power Administration's substation at Springl, Mo.; and (2) extensive expansion of Southwestern Power Adistration's substations and related facilities at Springfield and ıton in Mo., and at Tupelo and Weleetka in Okla.

# *Southeastern Power Administration*

**Chas. W. Leavy,** ***Administrator***

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DURING FISCAL YEAR 1960, Southeastern Power Adminis tion marketed 1,213,000 kilowatts of capacity (with peak genera of 1,462,760 kilowatts) and 4,048,025,373 kilowatt-hours of energy. was sold to 52 public bodies, 74 rural electric cooperatives, 1 Fed agency, and 6 privately owned utilities. Sales during the year ear $20,650,668.97, as compared with $14,863,863.87 for the previous y bringing the revenue earned in all years to a total of $111,269,108

The output was generated at 11 Corps of Engineers projects. T were the Wolf Creek, Dale Hollow, Center Hill, Old Hickory, Cheatham projects in Kentucky and Tennessee, the Allatoona Buford projects in Georgia, the Clark Hill project in Georgia South Carolina, the Jim Woodruff project in Florida, and the J H. Kerr and Philpott projects in Virginia.

The installed generating capacity of 1,283,600 kilowatts inclu a 12,000-kilowatt unit installed but not in commercial operation Cheatham project in Tennessee. Construction by the Corps contin on Cheatham as well as three other projects—Walter F. George Georgia and Alabama, Hartwell in Georgia and South Carolina a Barkley in Kentucky. The construction under way will add 524, kilowatts of installed capacity.

The combined output of Wolf Creek, Center Hill, and Dale Holl projects continued to be sold to the Tennessee Valley Authority unc a long-term contract. The entire output of the Old Hickory proj and the output of two units of Cheatham were sold under anoth long-term contract with the Authority.

All of the Philpott project output was sold to Appalachian Pow Co. under temporary arrangements pending the conclusion of neg tiations for long-term sale. Two-thirds of the Kerr project's outp continued to be sold under long-term contracts to the Virginia Electr

Power Co., and to 17 cooperatives in Virginia and North Caro-
; and the remainder continued to be sold under long-term con-
s to Carolina Power and Light Co., and to 16 public bodies and co-
atives in North Carolina.

rt of the Clark Hill project output was sold under long-term
racts to two public bodies in South Carolina. One-half of the
ut of the Clark Hill project and the entire output of the Alla-
a and Buford projects were sold under long-term contracts to
rgia Power Co. and 86 public bodies and cooperatives in Georgia.
output of the Jim Woodruff project was sold under long-term
racts to Florida Power Corporation and 6 public bodies and co-
atives in Florida.

e Congress appropriated for the fiscal year $261,000 for head-
ters operation and maintenance, and $455,625 for the purchase
rming energy and the payment of wheeling fees. Southeastern's
king force numbered 33 employees at the beginning of the fiscal
and 34 employees when the year ended.

# *Office of Saline Water*

### Dr. Arthur L. Miller, *Director*

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RESEARCH AND DEVELOPMENT activities of the Offic
Saline Water and the program to construct and operate five sa
water conversion demonstration plants is attracting worldwide at
tion. Lowering water tables and the increased competition for rea
available surface supplies in this and other nations, especially t
in the arid areas of the world, is quickening the interest in the fu
potential of low-cost converted sea or brackish water.

A sharp increase in the number of inquiries or visits from re
sentatives of foreign countries seeking information on the latest
velopments in the state of the art was readily noted throughout
year. An increasing number of United States research or indust
firms began to invest research funds or divert technical personnel f
other projects to develop solutions for the problems of low-cost sa
water conversion.

## *Present Activities*

The contracts awarded by the Office of Saline Water during fis
year 1960 mark an all-time high both in size and number. Fifty-f
contracts totaling $2,854,468 were awarded by the Office for resear
development, and demonstration plant construction. Many of
contracts awarded by the Office only partially covered the cost of
research and development projects. The balance of the cost
assumed by the research organization or industrial firm, giving c
crete evidence of the stepped-up interest of private companies in
development of new or improved conversion processes.

Many formidable problems still must be solved before economica
competitive fresh water can be obtained from the sea. The m
efficient sea water conversion plant operating in the world today

ucing 2.8 million gallons of fresh water per day at a cost of about
r thousand gallons. This is far too expensive to be considered as
urce of supply for any area where natural fresh water is readily
able. There are, however, areas where natural fresh water is not
able in the quantities required. To meet the water demands in
of these areas, conversion plants with a combined capacity of
t 20 million gallons of fresh water per day are now in operation.
iere is necessarily a lag between the developments of the research
e of any program and their practical application. Substantial
es have been made in the search for new or improved saline water
ersion processes. During the coming year, three plants will be
r construction by the Office which will incorporate a number of
atest process developments. Utilizing this new technology these
ts are expected to produce fresh water from the sea for the first
for less than $1 per thousand gallons.

### *re Prospects*

ice we have accomplished that objective, how much lower can we
onably expect to drive down in the foreseeable future, the cost of
erting sea and brackish waters to fresh? The prospect is so
ing, and the possibility so recent, that we must answer that we do
know in absolute terms. But on the basis of what we do know,
an reasonably assume that we shall soon be close to producing a
sand gallons of potable water from salt or brackish sources for
nts.

iat figure is lower than many people now pay and is within a dime
hat most Americans pay for water from their taps. In commu-
after community, the curves of cost—of converted water and water
i rivers and wells—are beginning to cross. And when they do—
that day is not far distant—the widespread and practical use of
erted water will be here.

## *Demonstration Plants*

iblic Law 85–883, approved by President Dwight D. Eisenhower
eptember 2, 1958, provided for the construction and operation of
saline water conversion plants to demonstrate the reliability,
neering, operating and economic potentials of the most promising
he presently known processes.

he Demonstration Plant Act designated the following general
raphic regions for the location of the plants: East, west, and
coast for sea water conversion plants, and the northern Great

Plains and the arid areas of the Southwest for plants designe convert brackish water to fresh.

The act further requires each plant to utilize a different pr and each process was to be chosen at 3 month intervals beginnin March 2, 1959. The selection deadlines were met due to the dili efforts of a special Process Selection Board representing science, dustry, and Government. Members of the board are: Dr. Ralph M gen, president, Rose Polytechnic Institute; Dudley F. Phelps, pr dent, the J. G. White Engineering Corporation; and Captain I Monk, Department of the Navy.

Acting on the recommendations of this board, Secretary Sea selected three of the processes during the last quarter of fiscal y 1959 and two in fiscal year 1960. The selection of processes completed ahead of the schedule set forth by the Congress in authorizing legislation.

Nearly 200 communities, many offering more than one site, appl for one of the authorized plants. A Site Selection Board consist of three engineers with vast experience in water supply problems appointed to evaluate the proposed sites. Members of this boa Mr. S. T. Powell, of Sheppard T. Powell and Associates; Mr. Le S. Finch, vice president and chief engineer of the Indianapolis Wa Co.; and Dr. W. C. Schroeder, University of Maryland, carefu studied information submitted by the interested cities and comm nities and personally inspected many of the proposed sites bef submitting their findings to the Secretary of the Interior. By t end of fiscal year 1960 Secretary Seaton had selected four sites a proposed sites on the east coast were being processed for final selecti

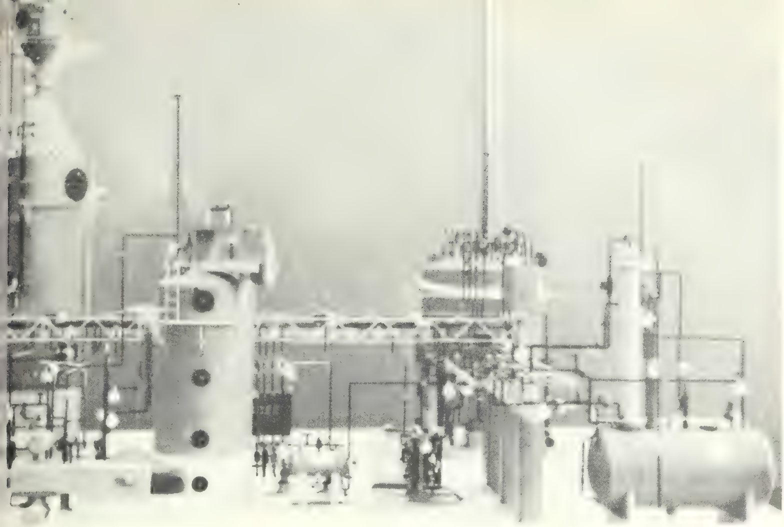
## *Demonstration Plant Processes and Sites*

The processes and sites for the demonstration plants are as follow

- Long tube vertical multiple-effect distillation, Freeport, Tex.
- Multistage flash distillation, San Diego, Calif.
- Electrodialysis, Webster, S. Dak.
- Forced-circulation vapor compression, Roswell, N. Mex.
- Freeze demineralization, east coast (site to be selected)

The construction specifications for the first plant at Freeport, Te were issued on April 1, and bids were opened on May 24, 1960. T Chicago Bridge and Iron Co. submitted the successful low bid $1,246,250. The plant is scheduled to be completed and in operatio by May 7, 1961.

The specifications for the second and third plants were complete by the end of the fiscal year and have been issued. The Freepo plant was designed by W. L. Badger Associates of Ann Arbor, Mic



*of 35,000 GPD freezing process pilot plant being built at St. Petersburg, Fla.*

Fluor Corporation of Los Angeles is designing the San Diego , and the Department's Bureau of Reclamation is preparing the fications for the Webster plant.

## *Basic Research*

any dynamic research and development program, considerable asis must be placed on fundamental research, since new ideas w processes can be developed only through such basic studies. onversion processes already selected for demonstration certainly ot the best that can be developed, even though they are the most nced of their type. Research can improve the efficiency of those ods, develop entirely new methods, and solve specific related problems such as heat transfer, corrosion, scale deposition, and others. rrent research includes laboratory and theoretical investigations or 7 new conversion processes, scale formation in distillation and odialysis equipment, membrane development (both ion selective smotic types), heat transfer, corrosion, use of radioisotopes, etc.

### *Processes*

e potentially promising new conversion process involves the use hydrates such as light hydrocarbons and halogenated methanes thanes. These substances form solid hydrates containing many of water per mole of agent. Essentially, the process consists of cting saline water with a liquid hydrating agent, separating the lline hydrate formed under the proper conditions, washing and nposing the hydrate into pure water and hydrating agent. Funntal research aimed at determining the various agents which form

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hydrates at reasonable temperatures and pressures and the therm namic properties of those agents is in progress.

Another new system under study utilizes a combination of ele dialysis and resin-bed treatment, made possible by new materials techniques which may minimize the inherent difficulties of each p ess. The proposed method utilizes conductive ion exchange mate which can be regenerated by means of an electric current and ion se tive membranes to reduce the tendency of mixing the two solut

Work on determining the practicality of the osmionic-conve process has been continued. This method is somewhat similar to trodialysis except that no electrodes or outside electric current i quired. The driving force causing demineralization is produce the concentration difference between a brine and feed water. T laboratory prototypes have been fabricated and successfully opera

Among other potential processes under investigation are: (a) electrolytic demineralization cycle using a pair of porous electro one responsive to the cation and the other to the anion. The techn feasibility of the process has been demonstrated and efforts are be directed toward the preparation of more economical electrodes electrodes with greater capacity; (b) capillary diffusion; and (c) of radioisotopes (actually radiowastes) as a source of energy fo conversion process.

### *Research Investigations*

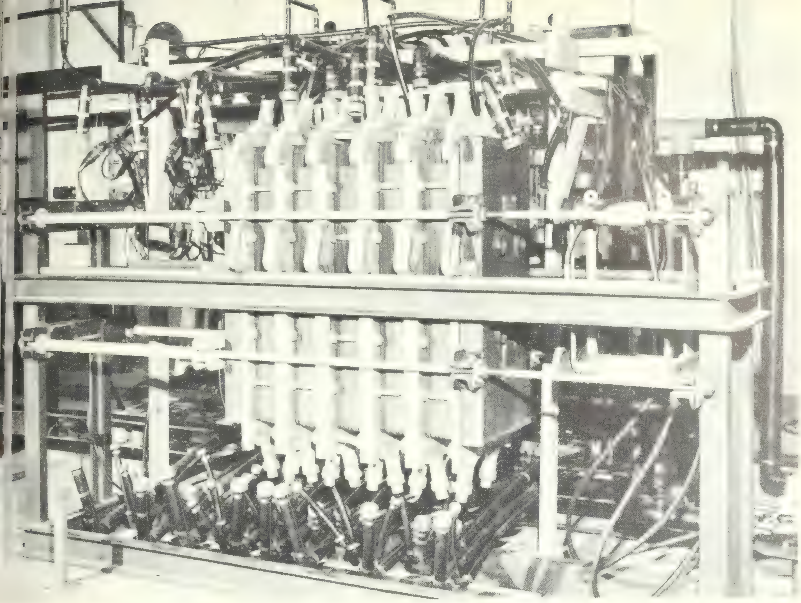
The deposition of salts in distillation and electrodialysis equipm under certain conditions is a serious problem and it is essential t methods for eliminating or alleviating scale be developed. Two f damental research investigations aimed at obtaining a better und standing of scale formation in both types of equipment and develop means of controlling it are being carried on.

Basic research investigations having as their primary objectives development of improved or new ion selective and osmotic membra are underway. If successful, such membranes will benefit the elect dialysis, osmionic and reverse osmosis processes.

The use of acoustic vibrations to improve heat transfer rates in d tillation units is under study and the first phase of a study on corrosi problems attendant with saline water conversion is nearing co pletion.

## *Processes Development*

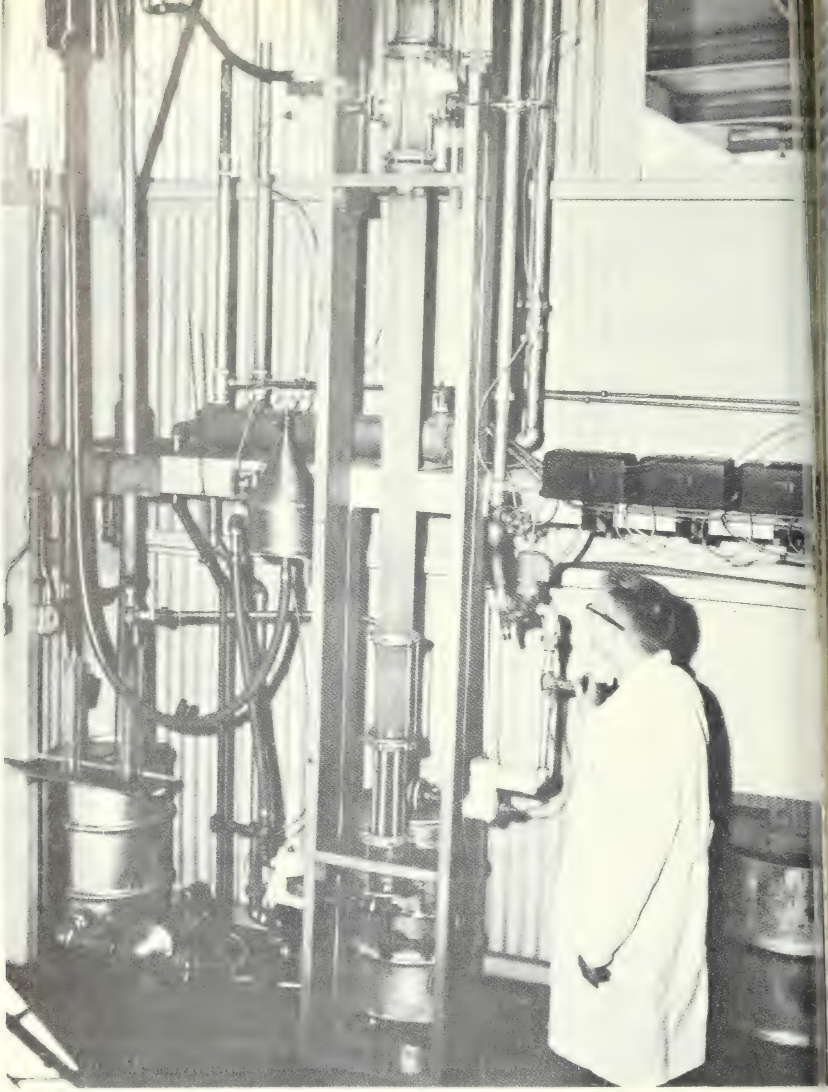
Successful operation was obtained on a 15,000-gallon per day pi plant using a direct freezing process. This new process uses fla evaporation of precooled saline water to make ice, followed by washi



*) type electrodialysis demineralizer—one of four types of equipment being
uated for the Office of Saline Water by the Bureau of Reclamation laboratories
enver, Colo.*

rine from the ice. At the close of the fiscal year, the pilot plant was
g moved from Syracuse, N.Y., to Harbor Island, N.C., for additi-
al operation on sea water. Increased activity in the development
reezing processes was reflected in the initiation of a project to build
,000 gallons per day pilot plant utilizing direct freezing with a
ndary refrigerant and incorporating two ice crystal washing sys-
s previously developed in the laboratory. Another promising
roach in the development of freezing as a practicable means of
water conversion was realized in the operation of a laboratory
t unit wherein the size of the ice crystals was controlled so that
hing procedures could be simplified. Economic projections of
ratory and pilot plant data indicate that freezing processes will
pete favorably with developments in distillation.

he operation of the long-tube-vertical pilot equipment at Harbor
nd has continued in an effort to control the calcium sulphate scale
blem by the same type of sludge recirculation technique previously
eloped for calcium hydroxide. Also at Harbor Island, the testing
he large rotary vapor compression still was completed. However,
itional research and development on rotor designs and water-
eading techniques and additional economic analyses were continued
he laboratories. Tests made on two types of small rotary vapor
pression stills showed further development is necessary. Work
begun on a new distillation system based upon development of a
ed-film evaporator. Studies on the vapor reheat flash process
which there are no metallic heat transfer barriers continued with
hasis on the liquid-liquid heat exchange phases.



*Experimental direct contact heat exchanger being operated at San Jose, Calif. T*
*is part of the vapor reheat flash distillation system.*

## *Cooperative Research*

Membrane processes, particularly electrodialysis, have shown i
portant application in the treatment of brackish waters; future
velopment in both membrane and equipment may make these proces
useful for the conversion of sea water. During the year, four types
commercial membranes have been evaluated and three different ty
of commercial equipment have been operated as a part of the expe
mental electrodialysis program underway at the Department's Bure
of Reclamation laboratories in Denver, Colo. Plans have been ma
for use of a brackish well water site near Denver for additional fie
testing programs. A means of practical use of ion exchange resins

*A. L. Miller, Director of the Office of Saline Water, signs the construction act for the Nation's first saline water conversion demonstration plant at Free-Tex. With Dr. Miller are (l. to r.), Joseph L. Miller representing the success-w bidder, the Chicago Bridge and Iron Co., Russell Whitesell, representing ow Chemical Co., and Allen Cywin, Chief, Division of Demonstration Plants, of Saline Water.*

water demineralization may result from a new project initiated he pilot unit study of partial removal of scale components from water before conversion. The process depends upon using the entrated effluent brine from a distillation conversion process to nerate the resins.

ccessful operation of both plastics and glass-cover basin types of stills has been obtained at the Daytona Beach, Fla., solar distilla- research station. Ways to reduce cost of construction have been rmined. Prototypes of tilted types of solar stills are being in-ed for evaluation. Research on plastic materials is underway at tation and at several laboratories.

uring the year a series of four conferences were held on processes lopment. These were attended by representatives of contractors, erators, and proposers of research projects in the four major s. One on distillation processes and one on membrane processes held in Washington, D.C. One on freezing was held at Syracuse, ., and one on solar distillation at Daytona Beach, Fla. The latest lopments were discussed at these informal symposia and desir- future programs outlined.

hirty-three processes development contracts were current during year. Ten technical reports were published. Of particular in-st is the new contract initiating the engineering study of a new nical process based upon the use of hydrocarbon hydrates as a means of desalting water. The contracts include a study being m jointly with the State of California on a solar heat application multistage flash evaporation; research on means of scale prevent investigation of secondary heat transfer media; compilation of t nical data; development of infrared reflecting plastics; evalua of external condensation with solar stills; and application of atom suspension techniques for disposal of concentrated brines.

Cooperation and participation with the Department of Defense effected on several development programs. The wiped-film evap tor development is jointly sponsored with the Navy. The Dayt facilities were made available for testing of an Army vapor-comp sion still and the Navy furnished evaporators for use in the ion change development.

No one process will ever be completely practical for all saline wa conversion. Different processes are advantageous for either of two major divisions of water to be treated—sea water and brack water. In addition, other factors related to location, such as costs, weather conditions, and waste disposal conditions, can de mine which of several processes would be the most economical.

# ffice of the Assistant Secretary

# *ineral Resources*

ce A. Hardy, *Assistant Secretary*

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

HE ASSISTANT SECRETARY for Mineral Resources discharges responsibilities of the Secretary of the Interior with respect to Department's programs in the field of the development and utiliza- of minerals and metals, including mineral fuels. He exercises ervision over: the Geological Survey, the Bureau of Mines, the e of Minerals Exploration, the Office of Oil and Gas, the Office inerals Mobilization, and the Office of Geography.

he Assistant Secretary serves as the principal spokesman for the artment of the Interior in the field of mineral affairs at the policy- ing level within the Federal Government. He participates in tings of the Council on Foreign Economic Policy as the Depart- t's liaison representative, and is the Department's representative he National Export Expansion Committee.

his Office continued to coordinate and direct the Department's vities under the Export Control Act, administered by the Depart- t of Commerce. During the past year the Department furnished nical and scientific information on a wide range of commodities, advised on the need for export controls to protect the domestic iomy.

n addition to the foregoing responsibilities, the Office of the As- ant Secretary, Mineral Resources, is the principal point of contact ween the Federal Government and the mineral industries.

## ff *Activity*

embers of the staff of the Assistant Secretary, Mineral Resources, ticipated in the first meeting of the International Lead-Zinc Study

Group. The session, held in Geneva in January–February 196 sulted in a continuation of voluntary curtailments of sales of on the part of several exporting nations. In light of the impr market situation, curtailments with respect to zinc, announced i course of the inaugural meeting of the Study Group held in 1960, were terminated.

Revised legislation to implement a long-range helium conse tion program was submitted. At the close of the fiscal year measure, which would contribute substantially to the conservatic this critical resource, had passed the House.

The Office of the Assistant Secretary, Mineral Resources, conti to supply information and advice to the Office of Civil and Def Mobilization concerning administration of the Government's strat stockpiling program and maintained a review of the overall stock situation. Additionally, the Office continued its active role in advi the Department of Agriculture with respect to acquisition of strat and critical material for the supplemental stockpile through ba transactions.

## *Petroleum and Coal*

The Office of the Assistant Secretary continued its extensive par pation in interdepartmental discussions dealing with basic probl of petroleum supply and requirements from both national security peacetime economic standpoints. The Assistant Secretary, Min Resources, served as chairman of the Oil Import Appeals Bo which was established to hear appeals arising from the gram of mandatory import controls on crude petroleum and petrol products.

By the close of the fiscal year, legislation creating an Office of Research had received approval of the Congress and was later sig by the President. The measure establishes within the Departmen the Interior a new agency to contract for research of immediate be fit to the domestic coal industry.

# ological Survey

## omas B. Nolan, *Director*

R MORE THAN 80 years the Geological Survey of the Depart-
it of the Interior has increasingly obtained information on the
irrence, distribution and quantity of the Nation's vast water and
eral wealth, at the same time gathering information concerning
and surface, and reducing this knowledge to reports and maps of
espread usefulness. Survey conducted mapping, investigations
reports have helped lay the strong foundation of America's
iomic well-being.

he need to supply more people with more things has placed heavier
onsibilities upon those required to look ahead and to plan for the
ssary raw materials and basic data. The immediate challenge is
ig met in the Geological Survey by the dedicated men and women
constitute our major asset. Upon their shoulders falls the burden
leveloping new techniques for achieving these objectives. The
ity to use the products of intellectual curiosity for the resolution
ractical problems in the national economy has been a most signifi-
contribution.

uring the past year, while accomplishing the scientific, engineer-
and administrative functions of the Survey, staff members partici-
ed in hundreds of individual projects, produced more than 1,200
rts, circulars, bulletins, geologic maps and professional papers;
e 1,350 new topographic maps.

lthough the Survey staff has remained about the same in numbers
eople employed, the results to be reported this year mark a new
i point in overall achievement.

*Measuring the earth's magnetic field, a Geological Survey aircraft with traili magnetometer traverses Chesapeake Bay.*

## *Geologic Division*

Fact-finding and research activities of the Geologic Division inclu a wide variety of investigations concerning the earth and man's a tempts to understand and use its surface and resources. These activ ties can be broadly grouped into three main categories; econom geology, regional geology, and research on geologic processes ar principles.

Economic geology is concerned with the study of known and p tential deposits in mineral-bearing and mineral fuels-bearing di tricts, the application of geologic knowledge to the solution of eng neering and land development problems, and the acquisition of ge logic information to guide the search for new sources of neede mineral raw materials.

Regional geology includes studies of the structure, composition, hi tory, and distribution of the rocks that underlie the United State its Territories and possessions. Because the nature of this work is e sentially exploratory, its underlying purpose also is, in large pa onomic, for it develops the information needed to appraise the po-ntial resources and to plan for the best use of the land.

The research on geologic processes and principles includes ob-rvational and experimental studies in the field and in laboratories develop and extend the usefulness of the geologic sciences.

A wide range of activities supplies information and services to her Federal agencies and is supported by them. These activities ex-nd geographically over much of the earth and recently have extended to space. Long-established methods as well as intricate research new methods are used to aid in the planning and accomplishment some of the varied tasks of the Army, Navy, and Air Force, the tomic Energy Commission, the National Science Foundation, the ternational Cooperation Administration, the National Cancer In-itute, the Bureau of Public Roads, and the Department's Bureau Mines.

In addition, geologic programs were carried on during the past ear in cooperation with 18 States and Puerto Rico. These range om geologic studies aimed at small immediate economic objectives broad geologic mapping programs contributing to the ultimate pub-ication of modern State geologic maps.

During the past year the results of the Geologic Division's investi-tions were published in 26 professional papers, 74 bulletins, 111 aps, and 3 circulars. In addition, 79 reports were placed on open e, and more than 200 reports were published in scientific journals. summary of the important results of the Geologic Division's cur-nt work was published as Geological Survey Professional Paper 0, entitled "Geologic Research, 1960." The first portion of this re-ort is primarily a synopsis of important new findings, and the second rt consisting of 232 short papers summarizes results of individual vestigations.

## *conomic Geology*

Detailed geologic mapping and other field studies primarily con-rned with economic geology were in progress in many areas from ast to coast during the past year, and many significant results were hieved. A few of the highlights are cited below.

*Base and ferrous metals.*—Geologic investigations being carried on several of the major mining districts have resulted in the discovery new deposits or yielded important new geologic guides that will d future exploration in all mining districts where geologic associa-ons are similar. Included are discoveries of new deposits of low-rade sedimentary iron ore in the Christmas area, Arizona and a new on-bearing formation about 200 feet thick in Iron and Dickinson

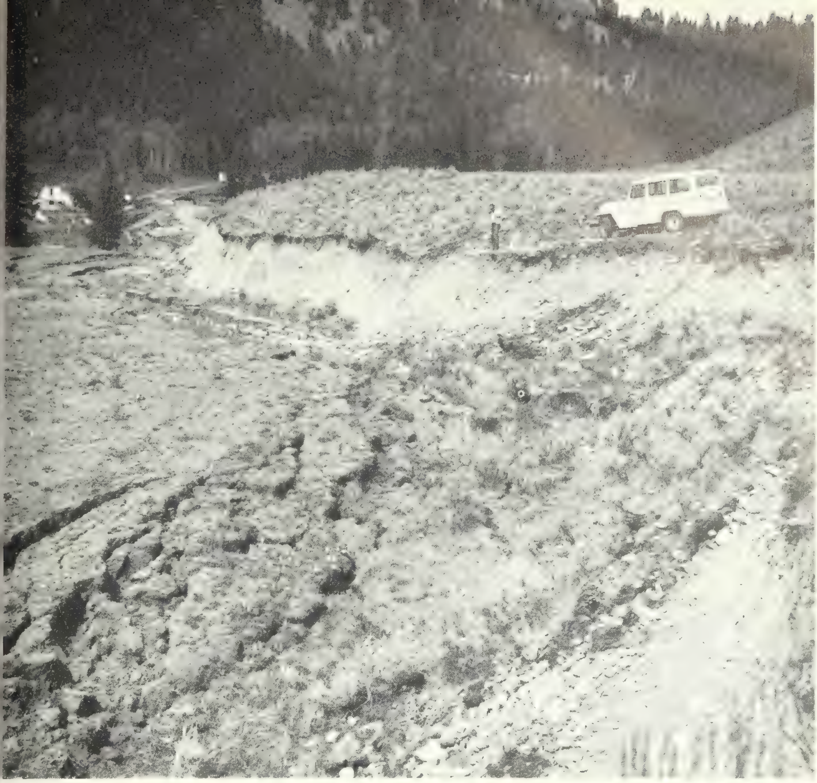
Counties, Mich.: and recognition of geologic guides useful to futu
exploration of the metalliferous veins in the Butte area, Mont., in t
Michigan copper district, in the copper-bearing rocks near Pin
Ariz., and in the Coeur d'Alene lead-zinc-silver mining district, Idal

*Light metals and industrial minerals.*—A new mineral associati
of beryllium is being studied in the Mount Wheeler mine, Nev., whe
the beryllium-bearing minerals phenacite, bertrandite, and beryl ha
been found in association with scheelite and fluorite along verti
quartz veins. Because these beryllium-bearing minerals are simil
in appearance to quartz and feldspar, they may have been overlook
in the past. Their recognition may lead to the discovery of ne
beryllium deposits in this area. In the tin districts of the Sewa
Peninsula of Alaska, beryllium has been identified in samples fro
bedrock sources at the Lost River mine, and at the Ear Mountain a
Cape Mountain tin areas. Beryl and phenacite have been identifie
and idocrase samples collected in the region also are consistently hi
in beryllium.

Studies of clay beds in Maryland indicate that extensive depos
are suitable for use as fire-clay and other deposits are suitable f
use in the manufacture of lightweight concrete aggregate. Of sp
cial interest, these latter "bloating" clays underlie extensive are
that include many potential strip-mining sites. The distribution
valuable deposits of flint clays in northeastern Kentucky has be
studied and mapped.

*Geochemical exploration and minor elements.*—Geochemical pro
pecting techniques require rapid analytical methods suitable for t
determination of trace amounts of various metals. Methods suitab
for more than 20 of the more diagnostic elements are in use. Durin
the past year, a new technique was developed for concentrating ion
constituents of natural waters by resin collectors, and a method w
devised for determining the molybdenum content of natural wate
employing resin collectors. Trace amounts of the volatile elemen
antimony, mercury and arsenic in vegetation can now be analyzed.
fluorometric procedure for determination of beryllium in rocks h
been developed that is sensitive in the range of 1 to 10 parts p
million.

*Organic fuels.*—Investigations that furnish basic mapping and stra
igraphic data on possible mineral fuel-bearing strata are in progres
in many parts of the country. For example, a summary of the petr
leum possibilities in Alaska delineated six possible petrolem provinc
in southern Alaska; three potential petroleum provinces of pre-Cen
zoic rocks and several potential petroliferous basins of Cenozoic rocl
in central Alaska; and a large area north of the Brooks Range



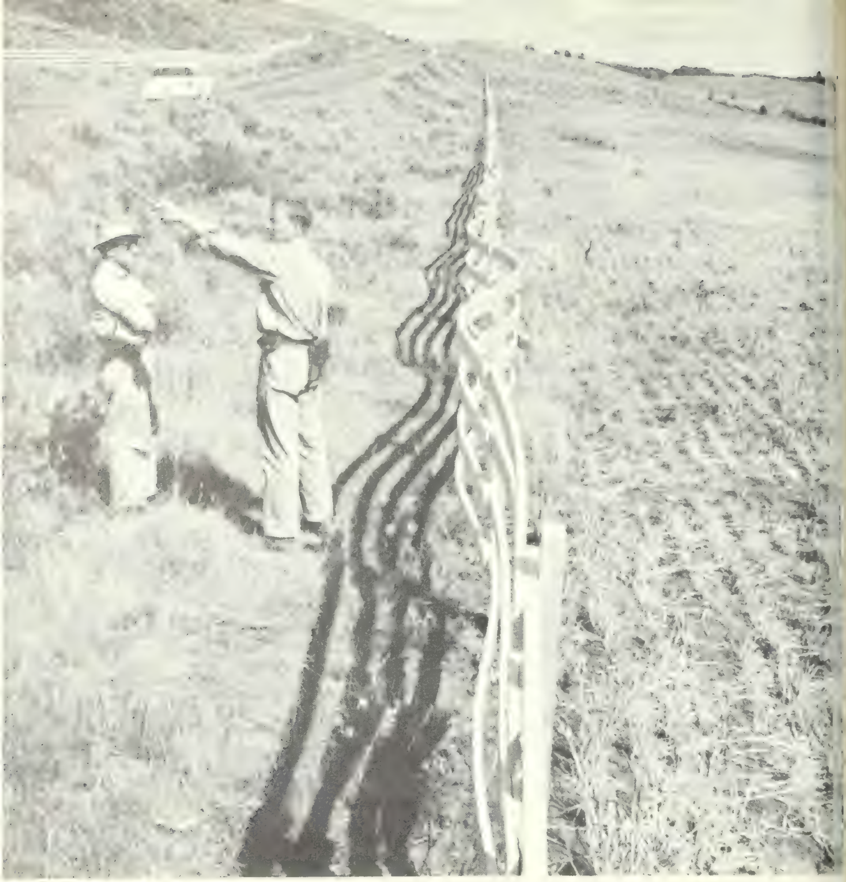
*his is Red Canyon fault east of Blarneystone Ranch, a freshly made fault scarp*
*used by the Hebgen Lake, Mont., earthquake.*

rthern Alaska, where good possibilities exist for petroleum pro-
ction.

A new estimate of coal reserves of the United States has been made.
ased on latest available data, some 1,660 billion tons remain in the
ound, of which about half is assumed to be recoverable. Studies of
veral coal fields are in progress, and recent estimates of coal resources
ve been prepared for the Trinidad field in Huerfano and Las
nimas Counties, Colo., an important source of coking coal for the
estern United States; the Mesa Verde area, Colo.; the Square Buttes
al field of western North Dakota; the southern Kolob Terrace coal
ld of Utah; the Kenai coal field of Alaska; and the coal-bearing
gion of southwestern Washington.

Studies in the Uinta basin of Utah and Colorado and in the Piceance
reek basin of western Colorado indicate very large reserves of shale
l in beds 15 feet or more in thickness and yielding 15 gallons or more
r ton.

*Engineering geology.*—Geologic data are being used with increasing
equency and success in planning construction and other land develop-
ent projects, especially in areas of heavy population expansion, and
problems of public safety and public health. As an example of
ecific application, the geologic examination of a proposed damsite



*Results of the Hebgen Lake earthquake are visibly recorded in this board fenc*
*which was compressed by the strong down-hill movement during the quake.*

at Devil Canyon, about 125 miles north of Anchorage, Alaska, ind
cated that shifting the site 100 feet upstream would avoid a larg
shear zone. Relocation of the spillway site was suggested to take ac
vantage of lower excavation costs afforded by the recognition of
favorably located buried preglacial valley. Similarly, savings in cos
increased safety, and reduction of natural hazards have been achieve
in such metropolitan areas as San Francisco, Los Angeles, and Seattl
where studies of landslides permit analysis of potential hazards an
plans can be made to avoid or minimize building in areas of probabl
future slides.

The series of earthquakes at Hebgen Lake, Mont., in the late summe
movement of debris and subsidence of a large area some 27 miles lon
and 14 miles wide. Geologic mapping was already in progress in thi
area, and an intensive study of the effects of the earthquake was ac
complished promptly.

Selecting the sites for underground nuclear tests, and evaluatio
of the effects of underground nuclear explosions requires detaile
knowledge of the rocks surrounding the point of explosion bot
before and after each test. These studies, carried on in behalf of th

U.S. Atomic Energy Commission, also indicate the behavior of the ocks during the explosion, that is, their response to seismic shock and xtreme temperatures and pressures and the changes brought about fusion.

Another program, also in behalf of the Atomic Energy Commission, concerns the safe disposal of radioactive wastes. It includes tudies of deep basins containing sedimentary rocks that might be uitable for underground storage of liquid wastes, as well as studies specific minerals such as vermiculite and montmorillonite that by on exchange, sorption, or other processes, will retain caesium, strontium, or other high-level waste products with safety. As a precautionary measure, the nautral background radioactivity has been determined for many areas being considered for installation of nuclear acilities. This information will be used to detect significant changes radiation levels.

The relationship of human health and geology are receiving expanded study. Previously, medical research has related certain hysiological effects to the presence or absence of such elements as odine, selenium, and fluorine, but few geologic studies were specifically med at analyzing the available geologic data to compare with health tudies. During the past year, a map was prepared to show the maximum reported fluorine content of ground water in each county in he United States. A joint study with the National Cancer Institute nd the Washington County, Maryland, Health Department is appraising the geological environment of that county to provide detailed ata on distribution of natural radioactivity and any unusual distribution of elements. An interesting byproduct of the development of n extrasensitive device to measure magnetic susceptibility of rocks as been the discovery of a measurable difference between cancerous nd noncancerous tissue both from animals and humans, apparently ue to a depletion of iron in the former.

The prolonged and intense volcanic activity at Kilauea from ovember through February was extensively studied and every phase refully recorded by the Survey's Volcano Observatory staff. Effective use of newly developed portable tiltmeters and of seismographs ermitted early warnings to be issued, so that no loss of life occurred. etter understanding of future volcanic activity is possible as a result the thorough and continuing study of all phases of eruptivity.

*Radioactive materials.*—Detailed studies of uranium deposits at mbrosia Lake, N. Mex.; Gila County, Ariz., in several basins in yoming, in the Southern Black Hills, S. Dak., and at Palangana lt dome in Texas, are developing specific information on the local onditions that prevailed during ore deposition and defining favorable eas for further exploration.

*Department geochemists sampling hot volcanic gases at Kilauea Iki, during development of a volcanic cone, November 22, 1959.*

Studies of uranium occurrence in coal in the Cave Hills area other areas of northwestern South Dakota and other coals in Mont North Dakota, Wyoming, Idaho, and New Mexico indicate that uranium-bearing coals are of low rank and contain more ash t nonuraniferous coals; that they occur with rocks containing volc materials and that the uranium content increases towards fractu permeable layers, or other probable ground water conduits. Th relations indicate that the uranium was leached from the volc materials and deposited in the coals by circulating ground wat The application of this theory to known stratigraphic informat has been successful in the discovery of several uranium-bearing nites, and also in indicating additional areas for exploration.

## *Regional Geology*

A large number of studies in progress in the United States dur the past year were aimed at exploring the composition, structu origin, and history of the rocks that form the earth's crust. Althou not specifically designed to furnish immediate solutions to econo and social questions, these studies provide the basic facts that may velop clues to the location of new sources of useful minerals, or proved utilization of the surface of the earth.

Primarily, these studies result in the preparation of geologic ma although geophysical, geochemical, stratigraphic, and paleontolo studies are used extensively to supplement, expand, or extend work in many areas. This research results typically in maps quadrangular areas bounded by lines of latitude and longitude, scales ranging from 1:24,000 to 1:250,000, depending on amount detail to be shown.

*ing crampons and cold weather gear, a Geological Survey geologist and his*
*nion are shown here climbing a glacier in the western part of Antarctica,*
*dy and sample exposures of basaltic rock.*

her work includes the preparation of several kinds of geologic
s of the Nation as a whole. One example is a paleotectonic
of the Triassic system, describing the sequence of development of
ical features of our country during this ancient time. Work on
nilar folio of the Permian system is nearly completed. Other
nwide maps that are being prepared include collaborative work
scientific societies in producing a new tectonic map and an
lute gravity map.

amples of work aimed at improving our understanding of major
ures of the earth's crust are the studies of several major intrusive
es including the Sierra Nevada batholith in California, the Idaho
olith, the Boulder batholith in Montana, and batholiths of the
rado Front Range and Northern Cascade Mountains in Washing-
To understand the history of major segments of the earth's crust
ires detailed knowledge of its component parts, so studies are

*Glacialogical data were collected by a scientist of the Geological Survey in we*
*Antarctica.*

broadly dispersed. Currently, work is in progress from Main
Hawaii, from northern Alaska to Puerto Rico, and in Antarctica.

Studies in the Antarctic suggest that much of Marie Byrd L
is a volcanic archipelago. In other parts of Antarctica, additi
knowledge of the geologic character of that least-known contine
slowly accumulating.

As an example of the results that can be obtained by combi
geological and geophysical studies, in the Los Angeles area a deta
analysis of the density of more than 2,000 samples was require
integrate the results of geologic mapping of the surface and
surface with gravity surveys. As a result, a compartmentalized
odensity model was constructed that permitted calculation of
residual regional gravity gradient. The results of this study indi
that the crust of the earth thickens landwards.

Geophysical exploration techniques have been directed at stu
of large regions to assist in determining geologic structure in a
of poor exposure and in determining the depth and configuratio
basement rocks and deeply buried magnetic masses. These stu
are providing information not previously attainable by older meth
High speed computers are routinely used to obtain quantitative in
pretations of geologic mapping problems, especially in the appl
tion of aeromagnetic methods. Recent drilling and seismic surv
at three places in Indiana have confirmed predictions of dept
Precambrian basement rocks as published in 1958. Magnetic meth

been used to a large extent in making a recently published map e layered magnetic rocks in the Iron River-Crystal Falls dis- of Michigan. A graphical method has been developed for de- ning the dip of buried geologic structures when the depth to the f the structure is known.

rial radioactivity surveys have proven to be helpful in geologic ing in some areas of poor exposure and low relief. Small dif- ces in content of radioactive minerals can be detected and corre- with specific rocks—for example, felsic igneous rocks and shales enerally more radioactive than mafic igneous rocks and carbonate

ctrical resistivity and induced polarization techniques have n promising results in geologic mapping of nonconductive lay- the study of metamorphic rocks under alluvial or glacial cover. techniques have been tried in small areas in upper Michigan, e, and Virginia. In addition, the value of induced electrical ization studies is being demonstrated in the search for low grade llic ores that are not sufficiently concentrated to cause other types ctrical or magnetic or gravity anomalies. In favorable circum- es, the measuresements may be used not only to locate ore bodies lso to estimate their grade.

## *ogic Processes and Principles*

addition to research stimulated by projects seeking specific eco- c objectives or by projects investigating specific areas, another of research is undertaken to increase our knowledge of natural sses within the earth, and the related geologic principles. Such rch is essential to develop better geologic techniques. These re- hes include studies in several fields such as paleontology, plant gy, geomorphology, geophysics, geochemistry, mineralogy, pe- gy, and isotope and nuclear geology.

dies in plant ecology and geomorphology are demonstrating matic relationships between plant type, topographic form, soil osition and water availability. In addition to previously well- n associations of some plants with certain soils and parent rocks, newer studies indicate that vegetation maps can be made to reveal n and development of land forms. Field studies in the Potomac r basin based on this approach have indicated that the classical pt of the origin of peneplains through cycles of erosion may not lid. The present landscape is considered to have formed by long- nued erosion under conditions similar to the present.

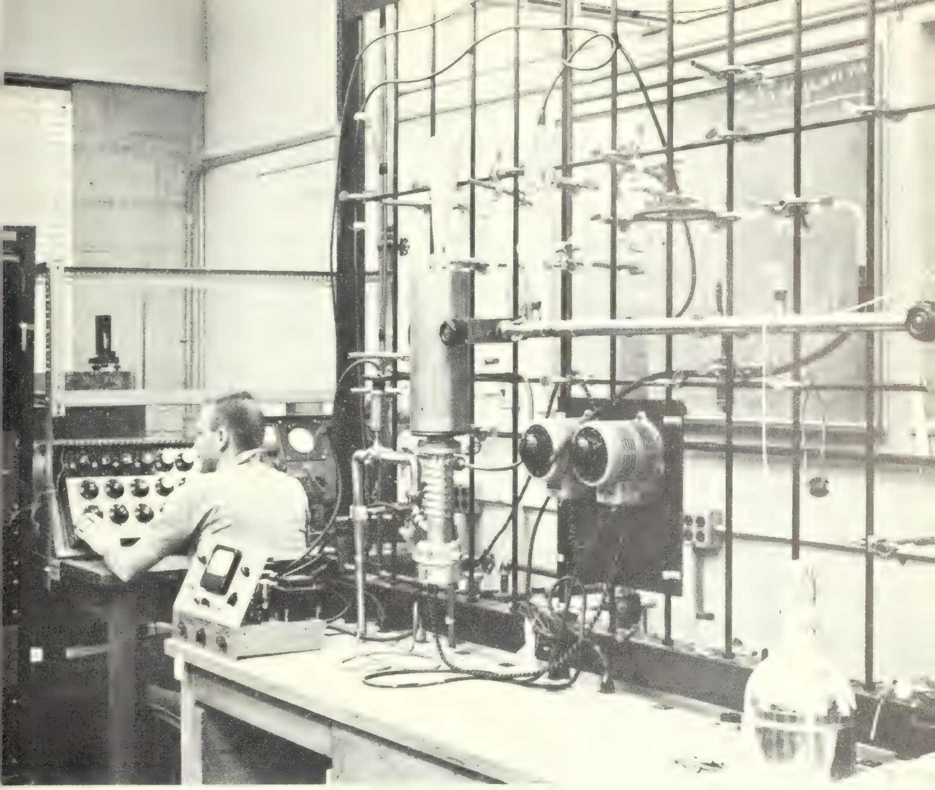
pical studies of the physical properties of rocks, experiments on deformation, and studies of past changes in the earth's magnetic

*Photogeologist measuring the diameter of a crater on the spherical surface o
moon. Using stereoscopic photoviewer, the geologic features of the moon's su
are carefully diagrammed to produce detailed maps.*

field are furnishing new geophysical information. New data on
mechanical, electrical, magnetic, optical, thermal, thermodynamic
mass properties of rocks and minerals are helping to explain many
vious empirical observations.

Pioneering studies of earth mechanics and the geometry of fault
suggest that larger earth fractures and faults can be related to sin
equations of plasticity. Studies of ballistic theory, impact phen
ena and data from nuclear and conventional explosions have been i
grated to develop a theory of how meteor craters developed. T
has been verified in field studies at Meteor Crater, Ariz. Result
these studies have been extrapolated for use in interpreting crater
the moon.

In this regard, a program of broad current interest in behalf of
U.S. Army Corps of Engineers was directed at mapping the featu
of the moon. Detailed study using photogeologic techniques resu
in distinguishing the relative age of many terrain features. C
parison of lunar craters and some comparable earth features sugg



*temperature calorimeter being used to determine the specific heat properties ks and minerals near absolute zero.*

ıll the large craters and most of the others were caused by meteor- npact. Rays extending from some of these are interpreted as esult of splashes of crushed rock ejected during crater formation. pical studies in mineralogy, petrology, and geochemistry include escription of new minerals, their chemical and physical prop- , and how they were formed; the study and description of rocks; he distribution and abundance of chemical elements and their pes in the earth's crust.

ıdies of mineral composition and structure reveal conditions dur- atural formation of these minerals as well as suggesting ways of esizing them and, utlimately, how to use them. For example, es of beta-spodumene, a lithium silicate mineral, have shown it ks on heating and swells on cooling, so that it can be mixed with al ceramic materials to mold precisely dimensioned forms that ı their exact size after firing.

ıdies of the distribution of isotopes of the elements are providing to ancient temperatures, to the establishment of a more exact gic time scale, and they give data on the composition and origin -forming fluids. Studies of isotopes of hydrogen have indicated lness in tracing oceanic currents. For example, the waters orig- ıg in Antarctica have about 1 percent less of the heavy hydrogen isotope, deuterium, than other ocean waters contain. In studi liquids obtained from minute bubbles in ore minerals from flu deposits in Illinois, the early minerals were found to contain similar to waters normally present in rocks of that locality, bu fluids from later minerals are progressively depleted in deuteriu

Analytical methods and laboratory techniques are continually improved and new equipment is devised to provide the new of data required in modern research. New equipment devel includes an electron microprobe X-ray analyzer for use in identi minute grains of minerals intergrown with other minerals; a he stage for use with X-ray diffractometer; a cooling cell that exte the useful range of study of temperature effects in fluid inclu in minerals under the microscope; a new device to convert se observations to numerical form for rapid coding and input high speed computers; and the development of a low-cost instru for beryllium exploration.

### *Foreign Geology*

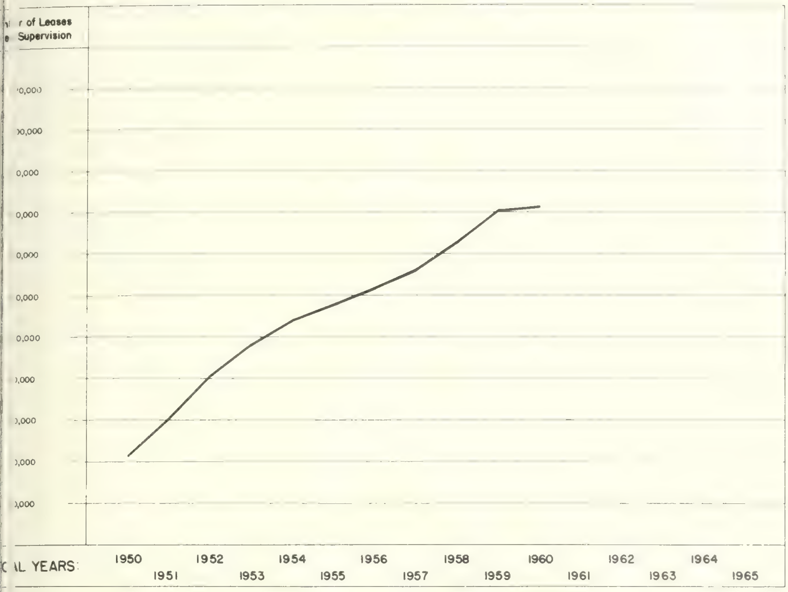
Technical assistance of the Geological Survey to foreign go ments is primarily designed to aid the growth of their econ through development of their mineral resources. This program u auspices of the International Cooperation Administration include training, advisory, and service functions of 47 of the Departm geologists working in cooperation with their host country counter in 12 nations, sharing advances in methods and techniques of geo research and investigations; and the training in this country of 121 earth scientists and technicians from 30 countries.

Cooperative geologic mapping or other field studies were in pro in Chile, Brazil, Libya, Saudi Arabia, Taiwan, Mexico, India, istan, Thailand, the Philippines, and Indonesia. Advisory ser to central government mineral agencies were an integral part o program in several of these countries and in Bolivia and Peru.

## *Conservation Division*

This Division classifies Federal lands as to mineral and wate sources and supervises mineral recovery under leases, permits, licenses on Federal, Indian, and Naval petroleum reserve lands headquarters staff and a field staff of geologists and engineers surveys, maps, and reports dealing with water power, fuels, mine and chemicals essential to the economy of the United States; supe mining and drilling operations to assure safe and economical pro tion by private enterprise of coal, oil, gas, and other minerals; supervise operations of the Federal Petroleum Board.

I ,GAS & MINERAL LEASES UNDER GEO. SURVEY SUPERVISION



## eral Classification

ring fiscal year 1960 a total of 30,724 cases were processed by the
ey including 7,040 cases involving the outright disposal of Fed-
l lands either with no reservation of minerals or with the reserva-
of one or more specified minerals. In addition, 21,033 cases in-
ing the exercise under Federal leasing laws of the Government's
t to lease a mineral substance to private enterprise were handled.
itial or revised definitions of 66 producing oil and gas fields were
ared concerning Federal lands and 358 unit-plan and participat-
area proposals were appraised geologically; 63 determinations
made of the productive limits of producing oil and gas deposits;
geologic significance of 248 new discoveries of oil or gas made on
fecting Federal leaseholds were reported for appropriate action;
petitive sales of oil and gas leases on 29 parcels of public land
reviewed; 18 appeals from decisions of the Department's Bureau
and Management affecting the disposal of Federal lands were
rted; 198 miscellaneous reports were prepared on the mineral
ntialities of specific lands for various agencies of the Federal
ernment.

ologists from field offices throughout the West made investiga-
and produced geologic reports and maps of considerable as-
nce to engineers in planning development and administering Fed-
l leases. These studies are also valuable to others concerned with

conservation, or with determining more efficient methods of r ery of leasable minerals.

Maps or reports were completed on the following fields or a: Cumberland National Forest, Kentucky, preparatory to oil and leasing activity in the area; in the Florida phosphate reserve t tain background information concerning proposed legislation fo toration of reserved mineral rights in patented lands; geologic s ture map and report on the Soso oil and gas field, Miss.; map o Gragg and Boonville gas field, Washburn anticline, Ark.; maps a report on the Precambrian of southeastern New Mexico and its tion to structure; geologic maps and report on the structure stratigraphy of the Delaware Basin.

Surface and subsurface studies of one section of the potash in southeastern New Mexico; contour maps of San Juan Basin Bisti fields, N. Mex.; revision of map showing areas of prospe value for oil and gas, map showing oil, gas, and exploratory w contour map and report on the Pinta Dome helium field, Ariz.; logic reconnaissance of damsites on the Trask, Siletz, and Neh Rivers, Oreg.; geologic reconnaissance of the Surprise Creek, Lake, and Nellie Juan damsites, Kenai Peninsula, a geologic map report on the Baranof Lake and Carbon Lake powersites on Bar Island, Alaska.

Stratigraphy of the Colorado Group of the Sweetgrass Arch Disturbed Belt, geologic report on damsites on the Lower Flat River, contour maps of Poplar, Bredette, Outlook, and west hal Sumatra Anticline fields, Mont.; contour map of the Sherwood a Renville County, N. Dak.; geologic and structure map of the Glen area, geologic and structure maps and report of the East Thermop area, geologic investigation of damsite on Dinwoody Creek, W geologic map and report on the Rifle Gap coal district, Colo.; pre inary stratigraphy and nomenclature of the Paradox member sa facies, Utah.

### *Waterpower*

Investigations were conducted in Alaska, Colorado, Oregon, W ington, and Montana during the year to determine the waterpo and storage possibilities of streams and lakes on public lands.

Eighteen sets of maps were published covering 307 miles of str channel and 26 damsites; six sets totaling 95 miles of stream cha and 8 damsites were ready to submit for publication, and eight covering about 200 miles of stream channel were in various stage preparation.

A report on the waterpower potential of streams along the Alaska inland between Thomas Bay near Petersburg and Juneau was sub- tted for publication as a water-supply paper. A report on Bradley ke was completed and is being reviewed for publication. Reports Nellie Juan Lake and Snow River on the Kenai Peninsula and on e lakes on Baranof Island, Alaska, and Trask River, Oreg., are in eparation.

A report on the Nehalem River, Oreg., was made available for pub- reference.

Work was continued on the program for making a systematic re- ew of waterpower withdrawals.

Lands withdrawn in powersite reserves total 7,205,637 acres, and reservoir site reserves 131,593 acres.

Two hundred and forty reports were prepared and submitted to the partment's Bureau of Land Management on the waterpower value lands affected in applications for rights-of-way, and 7,300 reports applications for land acquisition. Thirty reports were submitted applications to the Federal Power Commission for permit or ense, and 65 on applications for restoration of lands in powersite hdrawals.

### *ning*

Supervisory control is exercised by the Survey over mining activ- s concerned with prospecting, development and production of erals under permits and leases on public, Indian, and acquired ds.

Permits and leases issued under applicable laws and regulations in- ve operations for coal, potassium, sodium, and phosphate on public ds and such metals and minerals as copper, iron, lead, manganese, kel, tungsten, uranium, vanadium, zinc, asbestos, barite, bentonite, y, coal, garnet, gypsum, feldspar, fluorspar, limestone, mica, peat, osphate, pumice, quartzite, quartz crystal, sand and gravel, stone, l vermiculite on Indian and acquired lands.

Mining supervision includes responsibility for investigating and orting on applications for leases and prospecting permits; recom- nding lease terms, enforcing compliance with lease terms and ulations governing the conduct of prospecting, mining, and milling rations; and determining royalty liability of lessees, maintaining ounts, preparing statements and receiving payment of royalties l rentals.

As of June 30, 1960, there were under supervision 3,857 properties olved in leases, permits, and licenses in 32 States, of which 2,738 e on public land, 319 on acquired land, and 800 on Indian land.

*Survey petroleum engineer, accompanied by operator's representative, chec temperature and volume of butane going from lease to storage. On-site inspect assure resource conservation and protection of the Government's royalty inte*

Production from such lands during the fiscal year is estimated 25,974,928 tons, valued at $165,065,401 with royalties amounting $7,718,076.

In order of magnitude and value, potash ranked first with 13,041, tons at $76,328,418 followed by coal, 5,433,342 tons at $33,914,5 phosphate, 2,180,183 tons at $5,281,675; and sodium, 1,012,694 ton $25,532,781. Other production in substantial quantity includes u nium, 1,371,757 tons at $20,316,485 and sand and gravel, 2,057,986 t at $1,694,247.

Of particular interest during the year was the delineation o mineable potash deposit on the Cane Creek Anticline southwest Moab, Utah, and indicated southeast extension of that deposit into nearby Lisbon Valley revealed by prospecting on permit land. tensified prospecting in the Green River area, Wyoming, disclo extension of known deposits of the sodium mineral, trona, result in extension of the defined leasable area.

Several of the major mining companies are continuing explo tion activities in southeast Missouri which has resulted in valua discoveries of lead and zinc in the sediments and prospectively va able discoveries of copper and iron in the basement rocks. Furth a modern mill near Viburnum with an initial capacity of 3,000 t per day and a potential capacity of 6,000 tons per day was put i operation to process the new production.

## *and Gas Leasing*

upervision of oil and gas activities includes operations for the dis-
ery, development, and production of crude oil, natural gas and
ducts extracted from natural gas, on Federal, Indian, and certain
al petroleum reserve lands.

*Table showing supervised oil and gas activities*

PROPERTIES AND WELLS UNDER SUPERVISION

| Lands | Number of properties | Acres | Number of States | Wells spudded | Wells completed | Completions productive [1] | Number of wells—June 30 | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Productive [1] | Total |
| : | 139, 389 | 113, 633, 091 | 24 | 1, 982 | 2, 091 | 1, 341 | 18, 238 | 31, 172 |
| | 527 | 2, 141, 049 | off 3 | 404 | 540 | 427 | 1, 696 | 2, 421 |
| red | 6, 726 | 4, 854, 468 | 31 | 81 | 77 | 25 | 315 | 864 |
| ı | 12, 320 | 4, 471, 529 | 16 | 633 | 700 | 496 | 6, 826 | 11, 258 |
| petroleum ve No. 2 | 17 | 9, 226 | 1 | 13 | 12 | 12 | 469 | 729 |
| ry and ellaneous | 20 | 9, 969 | 5 | 22 | 9 | 9 | 147 | 182 |
| Total | 158, 999 | 125, 119, 332 | | 3, 135 | 3, 429 | 2, 310 | 27, 691 | 46, 626 |

PRODUCTION, VALUE, AND ROYALTY LANDS UNDER SUPERVISION

| Lands | Oil, barrels | Gas, 1,000 cubic feet | Gas liquids, gallons | Value | Royalty |
|---|---|---|---|---|---|
| | 148, 495, 000 | 499, 334, 000 | 338, 462, 000 | $471, 861, 000 | $58, 260, 000 |
| | 40, 765, 000 | 234, 328, 000 | 0 | 170, 668, 000 | 29, 787, 000 |
| ed | 5, 621, 000 | 26, 647, 000 | 434, 000 | 23, 812, 000 | 2, 961, 000 |
| | 60, 424, 000 | 93, 850, 000 | 98, 597, 000 | 177, 774, 000 | 21, 730, 000 |
| petroleum reserve No. 2 | 4, 771, 000 | 4, 871, 000 | 13, 386, 000 | 16, 598, 000 | 2, 272, 000 |
| ry and miscellaneous | 1, 200, 000 | 39, 282, 000 | 450, 000 | 8, 874, 000 | 1, 246, 000 |
| Total | 261, 276, 000 | 898, 312, 000 | 451, 329, 000 | 869, 587, 000 | 116, 256, 000 |

ltiple completions (2 or more separately productive zones) are counted as separate wells.

.—Production and royalty figures include some estimates. Royalty figures do not include revenues
ntals and bonuses.

nitization activities of oil and gas operations involving public
acquired land were reflected in the approval of 94 new unit
s during the year and the termination of 49 previously ap-
ed unit plans, leaving 420 approved plans covering 7,923,103
s outstanding.

the outer Continental Shelf 4 such plans were approved and
s terminated. The total now stands at 15, embracing 375,800
. About 60 percent of the petroleum, 40 percent of the natural
and 71 percent of the gasoline and liquified petroleum gases ob-
d from Federal lands during the year was produced under ap-
ed plans of unit operation.

Indian lands 11 new units were approved and 1 was terminated,
otal number of plans in effect at the end of the year being 60,
lving 121,887 acres.

There were 147 drilling units, or communitization agreements proved during the year and 2 terminated making a total of 1 outstanding as of June 30. There were three development contr approved during the year and none terminated. The total nun of such approved contracts outstanding on June 30 was 14 involv 4,644,830 acres.

## *Connally Act Administration*

The Connally Act of February 22, 1935, supports conserva activities of oil-producing States by prohibiting interstate shipn of oil produced in violation of certain State oil and gas conserva laws.

The act is administered by the Federal Petroleum Board der supervision and direction of the Geological Survey.

While the Connally Act is applicable wherever State laws l the rate of production and prescribe conditions for producing handling oil, its chief application is in 106 counties of Texas, and Eddy Counties in New Mexico, and all of Louisiana. The Bo also enforces provisions of the act in Mississippi, Oklahoma, kansas, Kansas, and other oil-producing States.

Unless exempted by the Board in writing and by notice, produ within the above designated areas are required to maintain d production records and file monthly production reports of operati on each lease in the oilfield. Transporters and refiners are also quired to file monthly reports. Leases inspected number 4,645, th visited 1,185, and 50 pipelines were checked, involving the visiting 411 oilfields and the conducting of 1,551 interviews. Twelve lations of the Connally Act were detected.

There were 17 cases of alleged violation of the act on the doc of the Board when the fiscal year began and three new investigati were started. Seven cases were closed by court action, resulting fines of $52,900.

## *Water Resources Division*

Another primary responsibility of the Geological Survey is to vide basic facts on the occurrence of water, its quantity and qual and the manner of its use. Such data are needed to aid in solving Nation's mounting water difficulties. Increasing requirements water have created many new problems and intensified some of th that have plagued the Nation in the past. Some of the paramo problems related to responsibilities of the Water Resources Divis of the Geological Survey include:

Impact of a growing and shifting population on water supplies,
ompanied by an accelerated increase in water requirements for
stry and agriculture.

Limitations on water development and use brought about by
ioactive and chemical waste disposal from municipalities, indus-
s, and agriculture.

Effects of land use practices and urban development upon exist-
water supplies.

Water losses through evaporation and inability to capture sur-
runoff for later use.

Contamination of fresh water supplies by salt water intrusion in
cent coastal and inland areas.

The need to determine sources, character, and potential of water
arginal purity that might be suitable for upgrading through saline
er conversion methods.

Legal questions arising out of laws on water rights, flood zoning
insurance, or compacts between States.

Floods and the need for adequate design and operation of flood-
rol structures, forecasting flood stages and volumes, and enact-
t of flood zoning and insurance regulations.

ne Survey's water-resources investigations include systematic col-
on, analysis, interpretation, and publication of hydrologic and
ed data; appraisal of water resources of specific areas; study of
r requirements for industrial, domestic, and agricultural uses;
research and development to improve the scientific basis and
niques of investigations. The results appear as scientific or tech-
l reports and papers.

ecognizing that the usefulness of water-resources investigations
nds largely on availability of reports that meet the variety of
s for water information, the timely production of reports is
g emphasized.

uring fiscal year 1960, the Survey published 89 water supply
rs, 21 circulars, 14 professional papers, and 6 bulletins concern-
water. In addition, 51 reports on water were made available for
ic reference, and 334 manuscripts were approved for publication
operative State reports and as abstracts and articles in scientific
nals. Six water reports were prepared for the Senate Select
mittee on National Water Resources, a committee established in
to study the development and coordination of water resources.
recent years, emphasis has been placed on interpretive studies
ve more meaning to basic data. Added attention is being placed
search activities as a source of new knowledge and an improved
rstanding of processes in the hydrologic cycle is being sought.
e efforts are resulting in increased usefulness of the vast quantity

of basic data on water that have been systematically collected many years.

The program of water-resources investigations is a coordinate fort between Federal, State, and local agencies. Federal-State coo ative investigations began in 1895 and this kind of work has gr steadily, now constituting about 60 percent of the total prog Funds made available by States and municipalities in 1960 for c erative investigations include:

*State and municipal offering for cooperative water resources investigatio*

| State | 1960 | State | 1 |
|---|---|---|---|
| Alabama | $173,293 | Nebraska | $ |
| Alaska | 8,690 | Nevada | |
| Arizona | 249,762 | New Hampshire | |
| Arkansas | 76,283 | New Jersey | |
| California | 714,106 | New Mexico | |
| Colorado | 200,307 | New York | |
| Connecticut | 47,609 | North Carolina | |
| Delaware | 50,543 | North Dakota | |
| Florida | 337,991 | Ohio | |
| Georgia | 174,312 | Oklahoma | |
| Guam | 16,000 | Oregon | |
| Hawaii | 177,961 | Pennsylvania | |
| Idaho | 77,750 | Puerto Rico | |
| Illinois | 90,137 | Rhode Island | |
| Indiana | 203,776 | Samoa | |
| Iowa | 107,657 | South Carolina | |
| Kansas | 148,762 | South Dakota | |
| Kentucky | 165,685 | Tennessee | |
| Louisiana | 221,665 | Texas | |
| Maine | 26,111 | Utah | |
| Maryland | 71,375 | Vermont | |
| Massachusetts | 72,243 | Virginia | |
| Michigan | 139,677 | Washington | |
| Minnesota | 103,112 | West Virginia | |
| Mississippi | 93,589 | Wisconsin | |
| Missouri | 48,226 | Wyoming | |
| Montana | 83,003 | | |
| | | Total | 7, |

## *Surface-Water Investigations*

Streamflow and other surface-water data were obtained at 7, sites distributed throughout the 50 States, Guam, Samoa, and Pu Rico. A special summary of all streamflow records for the pe 1888–1950 is essentially complete. Reports were published for Hu Bay and Upper Mississippi River basins, Missouri River basin a Sioux City, the Central Valley, and Pacific slope basins in Califo

Flood-frequency analyses, parts of a nationwide study, were c pleted for Pacific slope basins in Washington and upper Colum River basin, Snake River basin, and Pacific slope basins in Ore and lower Columbia River basin. Pending completion of this pro preliminary statewide analyses are being conducted in coopera with several State agencies. Reports were made available in covering the States of Washington and Maryland.

Five flood reports were published as water-supply papers circulars:

*pling the sediment load of the Solomon River at Beloit, Kansas during a flood.*

Floods of April–June 1953 in Louisiana and Adjacent States.

Floods of January 1953 in Western Oregon and Northwestern California.

Summary of Floods in the United States During 1953.

Summary of Floods in the United States During 1954.

Floods of January–February 1959 in Ohio.

ork is in progress on several other flood reports including floods anuary–February 1959 in Ohio and Indiana. As part of a con- ing program for mapping flood-inundated areas, the Survey has pleted manuscripts for publication covering 12 cities in Ohio ected to floods of January–February 1959; Calumet City, Ill., vicinity floods of 1954 and 1957; Des Moines, Iowa, and vicinity ls of 1903, 1947, 1954, and 1960; and Boulder, Colo., and vicinity. unoff studies of maximum annual floods were made for 2,443 nage areas of less than 400 square miles, at the request of the

Soil Conservation Service. Hydraulic data for 78 drainage-structu res were furnished to highway departments in 14 States.

Considerable progress was made on a new manual of hydrolog which was started during the 1959 fiscal year.

Compacts for the apportionment of interstate waters usually clude provision for measurement of streamflow, commonly by t Geological Survey. Nineteen such agreements are in effect and f others are under negotiation. Water-resources investigations w continued along the Canadian boundary, as required by the Bounda Water Treaty of January 11, 1909, between the United States a Canada, or by order of the International Joint Commission.

### *Ground Water Investigations*

This program places a major emphasis on area investigations a appraisal studies supported by research and training directed towa providing a thorough knowledge of future water problems and met ods by which they can be solved.

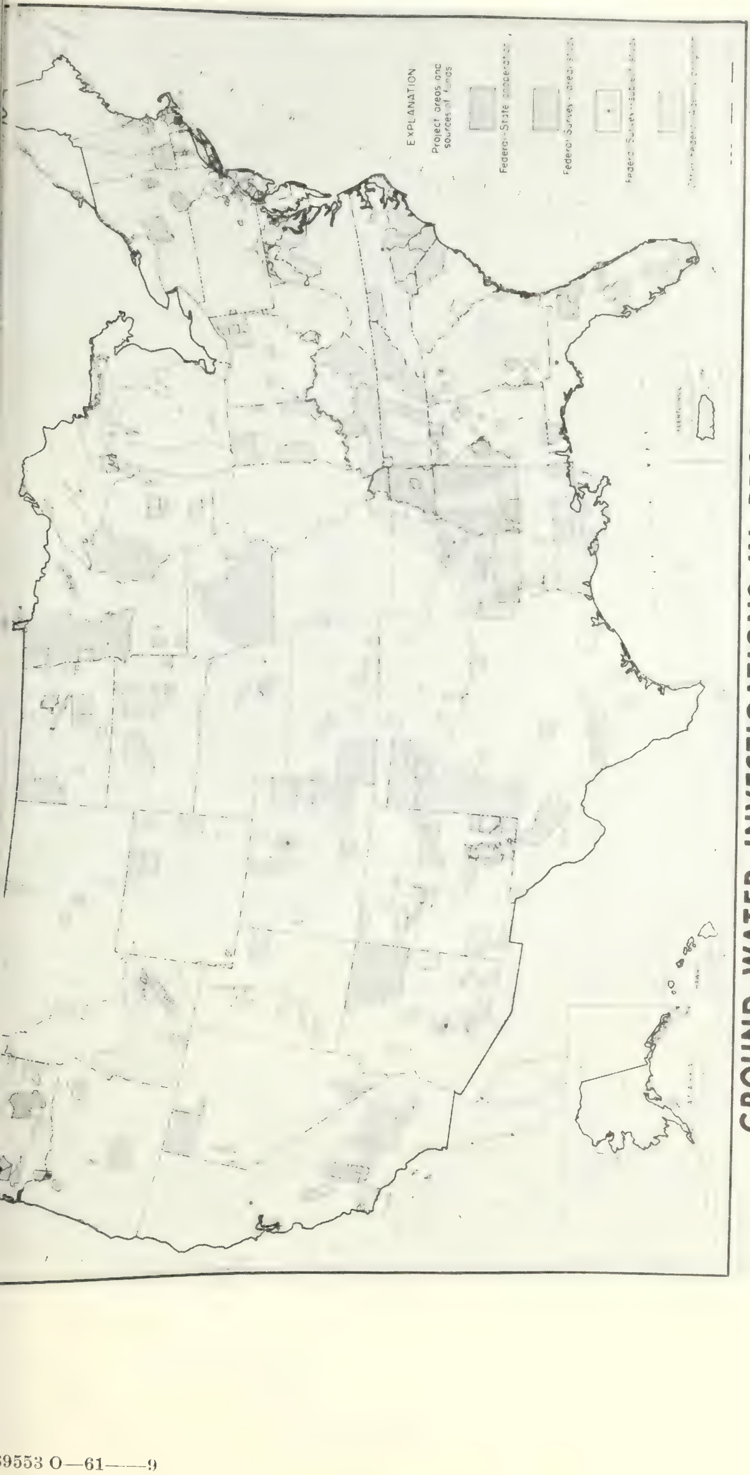
In addition to the more formal published reports released, 9, replies to requests for ground-water information were made by fie and Washington offices. The requests covered a wide range of nee as follows: Industrial 21 percent, municipal 14 percent, irrigation percent, private 25 percent, and other interests 22 percent.

In research, many projects are in progress which will lead to better understanding of the ground-water environment, particular the flow of fluids through porous media. It is imperative that th new concepts and principles be developed to enable more accura prediction of future ground-water trends, particularly in areas whe limited supplies are being "mined".

Studies are in progress to determine the factors and processes volved in the strain, deformation, and compaction of water-beari rocks resulting chiefly from changes produced by withdrawal ground water. The studies are designed to provide knowledge co cerning the storage capacity of aquifers, particularly as related to lo periods of ground-water withdrawal. The San Joaquin Valley California, which is an area of active subsidence, is being used a field laboratory.

As a result of widespread interest in the possible application radioactive isotopes in hydrologic studies, a project concerned wi the use of tritium in hydrologic studies was started in 1957. T objectives are to test the value of tritium as a hydrologic tool in stud of ground-water recharge, movement, and discharge, and in quanti tive evaluation through water-budget studies.

Type-area studies are directed toward developing geologic a hydrologic principles and techniques that will aid in the evaluati


EXPLANATION
Project areas and sources of funds
Federal-State cooperative
Federal Survey - areal studies

GROUND WATER INVESTIGATIONS IN PROGRESS, 1959–60

*A Geological Survey ground water engineer measuring flow of water from p discharge pipe as part of a nationwide inventory of the country's ground- resources.*

and development of water supplies in various terranes. A stud volcanic terranes is now in its third year in the Pacific Northwes the Columbia River Basalt. A study of limestone terrane was be in the central and southeastern United States in 1960.

## *Chemical Quality of Water Investigations*

Water-quality data were obtained at 907 sites in 1960. About third of these river observation stations are east of the Mississ River. In addition to this national quality-of-water measuring work, special investigations were continued in the basins of Colorado, Columbia, Snake, Mississippi, and other rivers. The qua he Nation's ground water was evaluated as part of the Survey's stigations of underground supplies.

everal other special studies also contributed to the fund of knowl- e about water quality. Some examples include: Factors controlling solution and deposition of iron and manganese; absorption of oactive elements by water-sediment mixtures; spectrographic iods for analysis of minor elements; use of tritium in hydrologic ies; occurrence of radiostrontium in water; and criteria for dis- uishing waters of deep origin.

ıbjects of reports issued in 1960 on water quality included: The rrence of iron in ground water; occurrence of strontium in nat- water; quality of surface waters for irrigation; worldwide runoff issolved solids; detergents in ground water; and some chemical ors relating to artificial recharge.

### *iment Investigations*

omprehensive studies of the movement of sediment in streams continued in the Missouri, Colorado, and Middle Rio Grande ns. Work included measurement and analysis of sediment loads related factors.

ther sediment studies included the mineralogy of river sediments, niques for the use of sediment reconnaissance data, effect of vari- roughness and other factors on bed-load transport, and methods measurement and analysis of sediment loads in streams. Investi- ons of sediment yields and trap efficiency of reservoirs in small ersheds were continued in collaboration with the Soil Conservation ice.

eports made public during the year discussed flume studies using ium sand, dispersion and concentration of radioactive wastes by m sediments, sediment transport in alluvial channels, ultrasonic surement of size distribution and suspended sediment concentra- , effect of fine sediment on the mechanics of flow, and related ects.

### *cial Investigations*

comprehensive study of the hydrology of the Colorado River n above Lees Ferry, Ariz., neared completion in 1960. All aspects e occurrence, use, and availability of water are being covered with ial emphasis on chemical quality and the interrelationships be- en surface water and ground water supplies. Planning was under- for a comparable study of the Lower Colorado River basin (be- Davis Dam), scheduled to begin in July 1960.

report on water requirements of the copper industry is in press. ilar studies on the petroleum industry, steel, and synthetic mate-

rials producers are in progress. Reports on the water resource
metropolitan areas of Boston, Mass., Flint, Mich., Hartford, C
and Syracuse, N.Y., are completed or nearing completion and wi
published during fiscal 1961. A similar study is in progress fo
Waterbury-New Britain, Conn., area, and new investigations
been started for Green Bay, Wis., and Wichita, Kans.

Work continued on a series of publications which will summa
knowledge about the water resources of each State. Drafts of rep
are complete or have been started for Alabama, Arizona, Delaw
Georgia, Idaho, Oklahoma, Oregon, and Rhode Island.

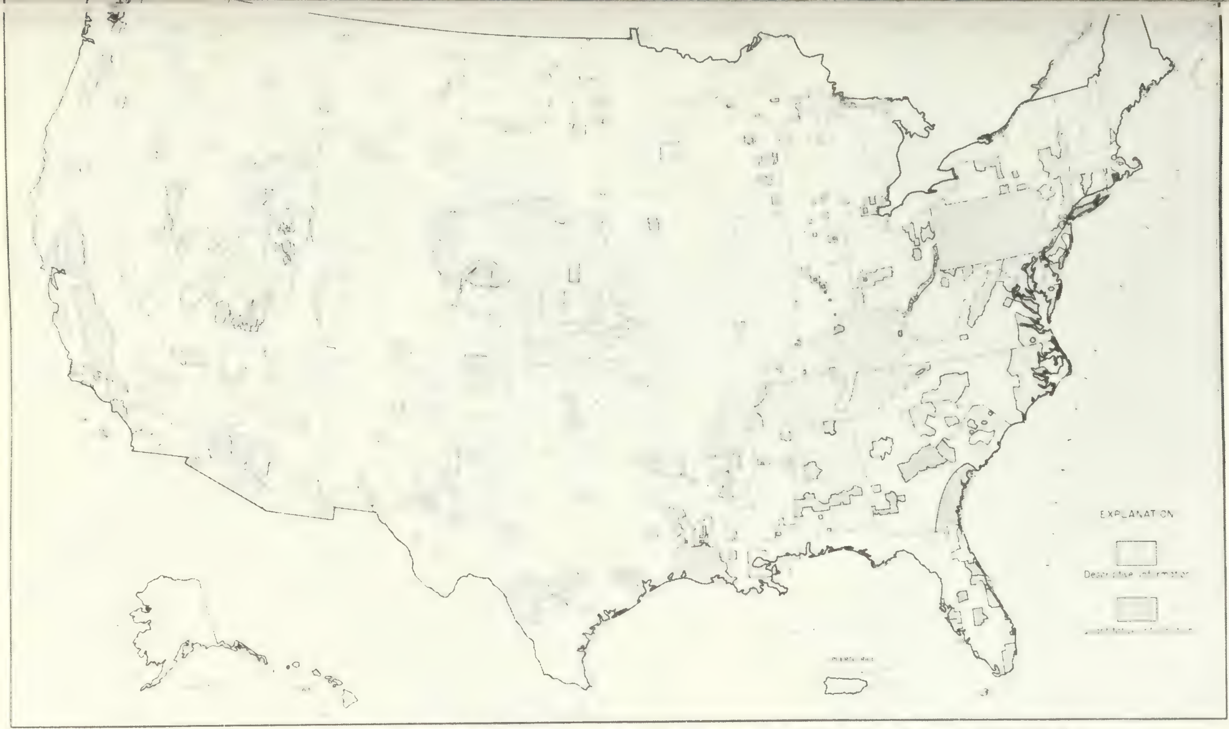
In the interest of conserving water and to reduce flood hazard
sections of the arid West, scientists are studying the problem
phreatophytes (water-loving plants) that grow in many stream
leys. In addition to wasting large quantities of water through eva
transpiration, these plants develop a junglelike growth that inva
and chokes the normal overflow channels of streams. Projects are
underway in the Salt River Valley, near Phoenix, Ariz., and in
Humboldt River Valley, near Winnemucca, Nev. To determine
effect and economic feasibility of eradicating large areas of th
weeds evapotranspiration studies are made in tanks up to 30 x 30
feet, planted in conformity with surrounding vegetation and provid
controlled systems for measuring water use.

## *Soil and Moisture Conservation*

Continuing activities included investigations of hydrologic
geologic conditions on public lands to provide data needed by ot
bureaus of the Department of the Interior for the management
those lands. Investigations were made in support of the developm
of water supplies in grazing areas in Arizona, Utah, Nevada, Ida
Oregon, and California. Data on runoff and sediment yields w
collected for reservoirs constructed as part of the conservation p
gram on public lands in Montana, Wyoming, Colorado, Utah, N
Mexico, and Arizona. Studies in stream morphology, aggradation a
degradation were made in Arizona, Nebraska, and Wyoming.

## *Technical Assistance Program*

Activities under the auspices of the International Cooperation A
ministration's Technical Assistance Program increased somewhat du
ing 1960. Long-term projects were being carried on in Afghanista
Chile, Iran, Libya, Pakistan, Philippines, Saudi Arabia, Tunisia, a
Turkey at the close of the year. Five administrative reports and fo
scientific reports on water were reproduced and distributed, and pe



GROUND-WATER REPORTS OF THE GEOLOGICAL SURVEY

PREPARED LARGELY IN COOPERATION WITH STATE AND LOCAL AGENCIES sonnel were assigned for short periods to Argentina, Brazil, E Haiti, and southern Rhodesia to assist in modernizing or expar surface or ground water investigations.

Technical assistance given continued to emphasize the establish or strengthening of foreign governmental organizations engage water-resource investigations. On-the-job training in investigat methods and techniques, and advisory help in organizational prob are the principal avenues for this assistance.

Survey personnel were giving training to nationals of coun in which long-term projects are being conducted. Additionally, ing 1960, visitors from Argentina, Brazil, Colombia, Chile, Eg Ethiopia, Ghana, India, Iran, Israel, Kenya, Libya, Pakistan, I the Philippines, Sudan, Turkey, and Uruguay received trainin the United States.

## *Topographic Division*

This Division prepares and maintains the National Topogra Map Series covering the United States. Operations include major mapping phases: Aerial photography, geodetic control, ph grammetric and field surveys, and cartographic work.

Related activities include research and development of instrume methods, and procedures, the preparation of special maps, and sup ing Federal agencies and the general public with published m advance map materials, aerial photography, geodetic control lists, map information.

By the end of August, 1959, the Pacific area headquarters had moved from Sacramento, Calif., to a new building at Menlo P Calif. This building, a model for modern topographic mapmak facilities, is the first Survey-owned building ever designed and structed for this specific use. It was dedicated by Secretary of Interior Fred A. Seaton on November 24, 1959.

Through the International Cooperation Administration, the G logical Survey extends technical assistance to accredited represen tives of many nations. During fiscal year 1960, extended periods technical training were provided by the Topographic Division visitors from Argentina, Nicaragua, Pakistan, Brazil, Ceylon, Ethiopia. On two occasions, needed information was obtained Libya for preparation of a base map of that country at 1:2,000, scale. A 6-month training course was conducted in Ceylon to tr photographic laboratory personnel and advice was furnished to Bra concerning the cartographic work of that nation and the training technicians in modern cartographic techniques.

e Division also assisted in a Geological Survey photogeology ing program for foreign participants, by providing a brief period struction in photogrammetry. Tours of Division mapping facil- or discussion of its activities and techniques were arranged for ors from abroad. Preparation of the 1:500,000 scale maps of ia and revision of foreign maps for the Army Map Service con- d.

aff work for the domestic names activity of the Board on Geo- hic Names continued and resulted in the publication of four lists ining decisions on 2,009 names. A fifth list containing 515 ad- nal names was printed on July 1.

## *eying and Map Preparation*

a result of the surveying and cartographic operations of the graphic Division, 96,000 square miles of new standard topo- hic quadrangle mapping were completed during the year, at s of 1:24,000 and 1:62,500 (1:63,360 in Alaska). In the re- n program, 6,800 square miles were completed. The Division completed 11,000 square miles of new quadrangle mapping, and square miles of revised mapping, using topographic survey data her civil agencies and the Department of Defense.

addition, numerous miscellaneous maps were published on a al format, some of them intended for research, administrative, formation purposes. Included in the miscellaneous maps were ,500 scale maps of the Hawaiian Islands of Oahu and Molokai, a 1:2,500,000 scale map of the United States in two sheets, and a 1:500,000 scale State map of Utah. Cartographic compilation progress for new State maps of Kansas, Maine, Montana, Ne- ka, Nevada, North Dakota, South Dakota, and Washington.

n area maps were published for Washington, D.C., Chattanooga, ., and San Juan, P.R. Now in progress are maps for the cities hreveport, La., Albuquerque, N.Mex., Madison, Wis., New York, ., and Indianapolis, Ind.

adrangle mapping projects were under way in most States, the in Islands, and Puerto Rico. Nearly 365 permanently marked gulation stations were established to provide control for areas ing more than 26,675 square miles. About 3,010 linear miles of sit traverse, 5,970 miles of electronic traverse, and about 13,400 r miles of leveling were run, with permanent marks established tervals of 2 to 3 miles. The computed results of these surveys are e available, on request, to other Government agencies and to the ic.

*Erecting portable observing tower for triangulation mapping observatio*

Field and office work concerned with Antarctica, was condu with the support of the National Science Foundation. Survey neers were members of both the Marie Byrd Land and Victoria traverse parties, serving as navigators and determining the graphic positions of mountain features. Another engineer on icebreaker U.S.S. *Glacier* determined geographic positions on Th ton Peninsula when, for the first time in history, a ship penetr the ice pack to reach the Bellingshausen Sea coast.

Antarctic photogrammetric and cartographic activity in Wash ton was concerned primarily with the preparation of three 1:50 scale maps in the vicinity of Knox Coast and with the start of compilation in the McMurdo Sound area. A library of Anta maps and aerial photography is being maintained.

Several special mapping assignments were undertaken for divisions of the Geological Survey and for other agencies. In category were topographic maps for the Department's Burea Mines studies of land subsidence in Arizona, location maps for ele powerplants for the Office of the Secretary, base maps for the Study Commission—Southeast River Basins, and continuatio the 1:1,000,000-scale series of North America for the Army Service.

During fiscal year 1960, cooperative programs were in effect 32 States and Puerto Rico. Total cooperative offerings during amounted to about $2,700,000. The large increase over the pre- is year was chiefly due to expansion of the Ohio program aimed ompleting the 1:24,000 scale mapping of the State in 1962. Ohio's ent offering is $1 million annually.

detailed summary of map production is shown in the following e:

*s (in square miles) mapped or revised during fiscal year 1960 for publication at standard scales*

[Contour intervals, 5 to 100 feet]

| State | Area mapped, scale | | Area revised | Total |
|---|---|---|---|---|
| | 1:24,000 | 1:62,500 | | |
| na | 644 | | | 644 |
| | | [1] 18,344 | | 18,344 |
| a | 3,124 | | | 3,124 |
| sas | 262 | 490 | | 752 |
| nia | 3,104 | 449 | 96 | 3,649 |
| do | 2,200 | 2,083 | 756 | 5,039 |
| cticut | | | 290 | 290 |
| are | | | | |
| t of Columbia | | | | |
| a | 559 | | | 559 |
| a | 62 | | | 62 |
| i | 176 | | 323 | 499 |
| | 355 | 818 | 55 | 1,228 |
| | 224 | | 86 | 310 |
| a | 3,873 | | 1,482 | 5,355 |
| | 218 | | | 218 |
| s | 2,768 | | | 2,768 |
| cky | | | 735 | 735 |
| ana | 258 | 1,104 | 380 | 1,742 |
| | | 383 | | 383 |
| and | | | | |
| chusetts | | | 377 | 377 |
| gan | 928 | 1,922 | | 2,850 |
| sota | 1,344 | | | 1,344 |
| sippi | 785 | | | 785 |
| uri | 1,022 | | 176 | 1,198 |
| na | 1,524 | 2,066 | | 3,590 |
| ska | 474 | | | 474 |
| la | 3,094 | 788 | | 3,882 |
| Iampshire | | | | |
| ersey | | | | |
| Mexico | 1,113 | 884 | 244 | 2,241 |
| York | 698 | | 199 | 897 |
| Carolina | 191 | | | 191 |
| Dakota | 1,935 | | | 1,935 |
| | 7,220 | | | 7,220 |
| oma | 1,978 | | | 1,978 |
| n | 834 | 1,878 | | 2,712 |
| ylvania | 1,631 | | 667 | 2,298 |
| Island | | | | |
| Carolina | 150 | | 16 | 166 |
| Dakota | 709 | | | 709 |
| ssee | 703 | | | 703 |
| | 7,870 | 2,143 | 258 | 10,271 |
| | 1,206 | 872 | | 2,078 |
| ont | 210 | | | 210 |
| ia | 343 | | | 343 |
| ngton | 86 | | | 86 |
| Virginia | 1,334 | | | 1,334 |
| nsin | 1,786 | 206 | | 1,992 |
| ing | 2,985 | 1,566 | 310 | 4,861 |
| Total | 59,980 | 35,996 | 6,450 | 102,426 |
| o Rico | | | 334 | 334 |
| Islands | | | | |
| Total | 59,980 | 35,996 | 6,784 | 102,760 |

---

53,360.

## *Research and Development*

Research and development to improve the efficiency of instrume tion for mapping operations was continued during the year. A l part of the research in methods, techniques, and procedures was centrated on maintaining and improving the accuracy of topogra maps. In the interest of improving horizontal map accuracy, a pr was initiated for empirical determination and analysis of represe tive horizontal errors in all component phases of the mapping pro The information will provide a more logical selection of the op tions in which technical improvements may be sought.

The manual of Topographic Instructions, formerly issued in a lo leaf multilith format, has been reorganized and is being revised prepared for publication in a sales edition. The complete series o volumes will constitute a comprehensive manual of topographic veying and mapping.

Major items of research and development in field-survey operat included development of a lightweight portable surveying tower wh can be erected by two men in about 1 hour and which can be tra ported without disassembly. It is intended particularly for theodo observations and electronic distance measurements over obstructi Tubular aluminum construction with welded one-piece horizon triangular sections contributes toward light weight, rigidity, and s plicity. This provides a standard 50-foot, 500-pound tower which be erected to greater or lesser heights by the addition or omission 12-foot standardized sections. Its light weight will permit transp tation by helicopter with the unit fully assembled.

Collimator equipment has been installed to enable faster and bet testing of theodolites and levels. The collimators will be of particu value in evaluating competitive instruments. The considerable nu ber of new instruments now available requires an increased amount testing, both in the laboratory and in the field. The collimator syste by permitting more accurate and complete laboratory testing, redu the amount of field testing required.

Research in the field of photogrammetry included studies of a n type of aerial film using a polyester base. This has been found t possess greater dimensional stability than the film currently used. is quite possible that this film may be used in obtaining all aer photography in the future, providing the film becomes commercia available in sufficient quantity. Its use should increase both the ho zontal and vertical accuracy of photogrammetrically compiled ma

A limited study of visual factors in stereoplotting was complet

*ey topographic engineers measuring angles with a theodolite atop portable r.*

s included the effects of applying refractive correction to a num- of stereo operators and of varying room illumination. The re- s were sufficiently encouraging to warrant an expanded investiga- along similar lines to give the findings a broader base for statisti- evaluation.

wo new super-wide-angle (120-degree) cameras were obtained for ing and evaluation. Consideration has been given to design fac- for super-wide-angle projection equipment and a system has been ised for modifying the Geological Survey camera calibrator to ac- modate the wider angle of coverage.

abrication and assembly of the first Universal orthophotoscope e completed. The new device is more complex and automatic than vious instruments of this type, and is expected to produce better ophotographs with a maximum of operator comfort. Either sh or ER–55 projectors may be used.

Research and development in cartographic instrumentation was
centrated on the improvement of instruments and techniques use
scribing operations. Several map revision techniques designed
use with the scribing process have been worked out and are now b
evaluated. Experiments are continuing in an endeavor to de
techniques and procedures that will satisfactorily permit both
and 15-minute maps to be processed from the same color-separation
terial.

### *Map Information*

Facilities for supplying information on maps, aerial photogra
and geodetic control surveys to Federal, State, and local governm
agencies, and to the public are maintained at the Map Informat
Office in Washington and at the Division's field offices. Services
clude over-the-counter map sales for the convenience of the pub
commercial firms, and Government agencies; sale of prints of adva
materials from current topographic mapping; graphic or tabular
semblies of map, photographic, and geodetic-control information.

The ninth edition of the index map, Status of Topographic Mappi
in the United States, was prepared for publication. It will be issu
in two sheets on the National Atlas format. One sheet will show
coverage for the 48 continental States; the other will show the cov
age in Alaska, Hawaii, Puerto Rico and the Virgin Islands. The n
edition will show by color and pattern the scale and quality of to
graphic maps available.

The tenth edition of the Status of Aerial Photography in the Unit
States, another index map, was also published on the National At
format. For the first time, it shows that there is complete aerial pho
graphic coverage of all 50 States, Puerto Rico and the Virgin Islan
The Map Information Office continued to serve as the central
pository for maps which make up the National Atlas of the Unit
States, and provide economic, physical, and cultural information.

## *Publications Division*

During the fiscal year 1,042 reports were submitted for publicatio
Of these 319 were for publication by the Geological Survey; 52 as pr
fessional papers, 62 as bulletins, 77 as water supply papers, 23 as ci
culars and 105 geologic maps in the Map Series. The remaining 7
were for publication by cooperating agencies for use in scienti
journals.

he following is a summary of map reproduction work completed
ng the year.

| | New | Reprinted |
|---|---|---|
| Topographic Division maps: | | |
| Standard topographic | 1,349 | [1] 445 |
| Standard topographic (engraved) | | 191 |
| Standard topographic (revisions) | 231 | |
| 1:250,000 scale | 43 | 18 |
| Scale conversions | | 55 |
| Planimetric | 4 | 9 |
| State base | 6 | 13 |
| State topographic indexes | | 88 |
| Miscellaneous | 24 | 3 |
| Geologic Division maps: | | |
| Geologic quadrangles | 6 | 3 |
| Mineral investigations | 28 | |
| Geologic indexes | 3 | 3 |
| Coal | 2 | |
| Oil and gas maps | 2 | 1 |
| Oil and gas charts | 3 | |
| State geologic | | 1 |
| Geophysical investigations | 42 | 1 |
| Miscellaneous investigations | 42 | 4 |
| Conversion Division maps: | | |
| River surveys | 35 | 4 |
| Water Resources Division: | | |
| Miscellaneous | 2 | |
| Total | 1,822 | 839 |

[1] Includes 19 maps totaling 24,100 copies printed by other Government agencies.

hese 2,661 new and reprinted map editions comprise 7,771,926
ies ranging in size from 13 by 18 inches to 50 by 72 inches.

n addition to the foregoing production, 1,080 jobs comprising mis-
aneous maps and other preliminary map services were completed.
s printing includes 238 maps totaling 728,353 copies of which 145
e illustrations comprising 484,981 copies for the Government Print-
Office for use in the Survey's book reports. The rest of the miscel-
eous printing and service was done for other units of the Govern-
t, including branches of the Survey and various States.

he total cost of all production was $1,464,594.99. Of this amount
,079 was received from other agencies for map sales and $14,155
paid by other agencies and miscellaneous organizations for print-
or service work.

### *tribution*

n addition to more than 40 million items on hand at the beginning
he year 400,321 copies of 200 separate reports in book and pamphlet
m printed by the Government Printing Office and the Interior
plicating Section and 7,490,015 copies of 2,661 new and reprinted
ps were received. The distribution of 4,579,090 maps, including
roximately 450,000 map indexes, constituted a substantial increase

of 266,483 copies over the corresponding total for the preceding f year. There were approximately 274,774 book reports and pampl distributed by the Survey this year.

The total number of maps, map indexes and reports distribute the Geological Survey this year as compared with last is shown in following table:

| | Fiscal year 1959 Maps, map indexes and book reports | Fiscal year 1960 Maps, map indexes and book reports | Percent of increase or decrease |
|---|---|---|---|
| Washington | 2, 787, 158 | 2, 786, 218 | |
| Denver | 1, 452, 989 | 1, 701, 381 | +17 |
| Fairbanks | 38, 957 | 46, 006 | +18 |
| Other field offices | 285, 447 | 320, 259 | +12 |
| Total | 4, 564, 551 | 4, 853, 864 | +11 |

## *Funds*

During the fiscal year 1960, obligations were incurred under direction of the Geological Survey totaling $65,328,255. Of amount 64 percent was appropriated directly to the Geological Sur 19 percent was made available by other Federal agencies, and 17 cent by States or their political subdivisions, and miscellaneous Federal entities.

*Source and use of funds in fiscal year 1960*

| | | |
|---|---|---|
| Topographic surveys and mapping: | | |
| Appropriation | | $14, 715, |
| Reimbursements from non-Federal sources: | | |
| States, counties, and municipalities | $2, 724, 713 | |
| Sales to the public of aerial photographs and copies of records | 118, 829 | |
| Miscellaneous | 53, 250 | |
| | | 2, 896, |
| Reimbursements from other Federal agencies: | | |
| Bureau of Reclamation | 908, 231 | |
| Department of the Army | 785, 255 | |
| Atomic Energy Commission | 130, 000 | |
| National Science Foundation | 160, 213 | |
| Miscellaneous | 208, 182 | |
| | | 2, 191, |
| Total appropriation and reimbursements | | 19, 803, 7 |
| Direct State payments | | 6, 7 |
| Total, topographic surveys and mapping | | 19, 810, 5 |

*Source and use of funds in fiscal year 1960*—Continued

| | | |
|---|---|---|
| ogic and mineral resource surveys and mapping: | | |
| Appropriation | | $11, 417, 473 |
| Reimbursements from non-Federal sources: | | |
| States, counties, and municipalities | $354, 149 | |
| Miscellaneous | 8, 965 | |
| | | 363, 114 |
| Reimbursements from other Federal agencies: | | |
| Department of the Air Force | 154, 625 | |
| Department of the Army | 1, 290, 449 | |
| Atomic Energy Commission | 1, 746, 294 | |
| Government Printing Office—map reproduction | 100, 123 | |
| International Cooperation Administration | 1, 144, 503 | |
| National Science Foundation | 57, 511 | |
| Miscellaneous | 345, 934 | |
| | | 4, 839, 439 |
| Total, geologic and mineral resource surveys and mapping | | 16, 620, 026 |
| er resources investigations: | | |
| Appropriation | | 11, 675, 431 |
| Reimbursements from non-Federal sources: | | |
| States, counties, and municipalities | $6, 170, 589 | |
| Permittees and licensees of the Federal Power Commission | 230, 478 | |
| Miscellaneous | 71, 967 | |
| | | 6, 473, 034 |
| Reimbursements from other Federal agencies: | | |
| Bureau of Reclamation | 879, 438 | |
| Department of Agriculture | 226, 978 | |
| Department of the Air Force | 131, 000 | |
| Department of the Army | 1, 836, 684 | |
| Department of Health, Education, and Welfare | 155, 177 | |
| Department of State | 114, 689 | |
| Atomic Energy Commission | 598, 964 | |
| International Cooperation Administration | 462, 963 | |
| Tennessee Valley Authority | 96, 948 | |
| Miscellaneous | 309, 434 | |
| | | 4, 812, 275 |
| Total appropriation and reimbursements | | 22, 960, 740 |
| Direct State Payments | | 1, 171, 819 |
| Total, water resources investigations | | 24, 132, 559 |
| and moisture conservation: | | |
| Appropriation | | 174, 825 |

*Source and use of funds in fiscal year 1960*—Continued

| | | |
|---|---|---|
| Conservation of lands and minerals: | | |
| Appropriation | | $2, 748 |
| Reimbursements from non-Federal sources: | | |
| Miscellaneous | | 1 |
| Reimbursements from other Federal agencies: | | |
| Miscellaneous | | 46 |
| Total, conservation of lands and minerals | | 2, 796 |
| General Administration: | | |
| Appropriation | | 1, 305, |
| Reimbursements from non-Federal sources: | | |
| Miscellaneous | | 14, |
| Reimbursements from other Federal Agencies: | | |
| Department of the Army | $142, 394 | |
| Miscellaneous | 330, 921 | |
| | | 473, |
| Total, General Administration | | 1, 793, |
| Summary: | | |
| Appropriation | | 42, 037, |
| Reimbursements from non-Federal sources: | | |
| States, counties and municipalities | $9, 249, 451 | |
| Miscellaneous | 499, 610 | |
| | | 9, 749, |
| Reimbursements from other Federal agencies | | 12, 363, |
| Total, appropriation and reimbursements | | 64, 149, |
| Direct State payments | | 1, 178, |
| Grand total | | 65, 328, |

# *ureau of Mines*

## arling J. Ankeny, *Director*

IE BUREAU OF MINES of the Department of the Interior com-
ted a half century of service to the Nation with the close of the
i0 fiscal year. Throughout the five decades that have passed since
creation by Congress in July 1910, the Bureau's major objectives
'e remained constant—to promote the wise and efficient use of the
tion's mineral resources, and to advance in every way possible the
ety and health of those who mine and process metals, nonmetals,
l fuels.

ignificant progress in many different approaches to these primary
ls was recorded by the Bureau during its 50th year. For example,
reau metallurgists developed new techniques for making special
pes of high-purity tungsten—most promising of the "missile
als"—and found a way of using uranium to impart new strength
steel. New applications of solvent-extraction and electrolytic proc-
s proved successful in experimental production of such metals as
kel, cobalt, vanadium, tungsten, molybdenum, columbium, tanta-
ı, and chromium.

lining research advanced with favorable results in experiments
h precast concrete to solve ground-support problems at an Idaho
al mine and with improvement of a Bureau technique that
mises increased output at a copper operation in Michigan. In
roleum studies, Bureau engineers helped enhance the efficiency of
erflood projects aimed at secondary recovery of oil in California
. Montana, while other Bureau scientists undertook new research
properties of missile fuels. Coal studies moved ahead with suc-
sful experiments in hydraulic mining of bituminous coal and pre-
inary research on hydraulic transportation of anthracite.

In the health and safety field, cooperative research by the Bur and industry reached the field-testing stage in a program to deve a continuous methane-monitoring system for use with electric powered mining equipment. A pocket-sized methane detector dev by the Bureau for miners was found suitable for coal-mine use. search was completed on controlling mine fires with high-expans foams, and mine operators were given practical advice on employ the method. The Bureau also stepped up its permissibility test services and health and safety educational programs.

The Bureau continued to gather and to publish facts on producti consumption, distribution, and other aspects of mineral trade home and abroad, and contributed the experience of its engine and technologists, who served under governmental technical-ass ance programs in many friendly foreign countries. It also part pated in projects to develop the varied resources of the Nation's s eral great river basins, and performed many special economic a statistical studies to develop essential information for defense pl ning and international trade negotiations. Meanwhile, output technical and scientific publications in the Bureau's series of resea reports continued at a high level.

To achieve greater efficiency in planning, programing, and co dinating research and development work at Bureau installatio throughout the Nation, responsibility for these functions was centr ized, during the year, in headquarters Divisions of Minerals, Coal, a Petroleum. At the same time, steps were taken to free research p sonnel in the field from many operating-management type duties

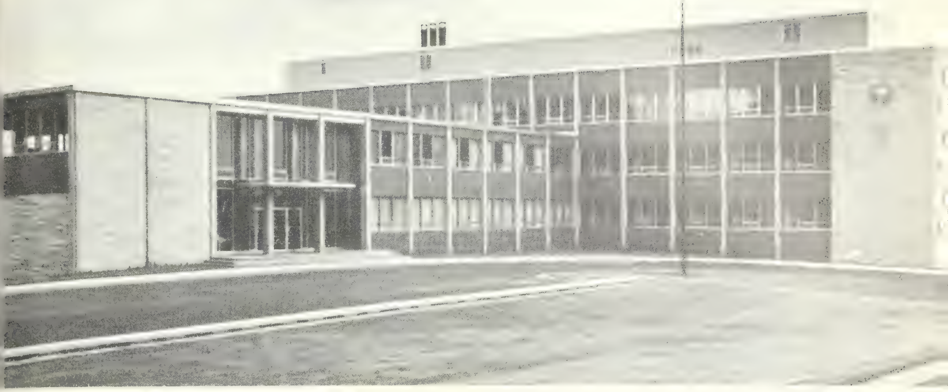
These activities, and many others in which the Bureau of Mi engaged during fiscal 1960, are described in the following pages.

## *Minerals Development*

The Bureau completed a planned realinement of its mineral-r search activities toward the end of the fiscal year. As a result, a ministrative lines were shortened to permit more effective techni direction and supervision of metallurgical and mining-resear establishments in the field. This streamlining was accomplish without impairing the Division's factfinding or programing functio

### *Ferrous Metals*

The Bureau's new Minneapolis Metallurgy Research Center at Fo Snelling, Minn., was occupied during the year with equipment a personnel transferred from other locations. The new facilities w enable the Bureau to expand studies in mining, minerals beneficiatio



*s modern laboratory and administration building at Fort Snelling, Minn., near neapolis and St. Paul, was occupied by the Bureau of Mines during the year peed research in the north-central States.*

l extractive metallurgy, especially those concerning iron and nganese, two of the Lake Superior region's major resources.

The Bureau's research program for ferrous metals was directed ncipally toward finding better ways to extract, prepare, and use h-temperature alloys of tungsten, molybdenum, and vanadium. e program included research on techniques for recovering iron, nganese, cobalt, and nickel from domestic resources and studies ned at conserving these resources. In addition, Bureau engineers estigated ferrous-metal mineral deposits and Bureau scientists eloped fundamental data on the physical and chemical properties several ferrous metals and alloys.

comprehensive report was published on the thermodynamic propies of manganese and its compounds, bringing scientific literature this subject up to date for the first time since 1934. A report was npleted on the distribution of iron minerals in the taconite area rounding the Mesabi Range of Minnesota, and another was pubhed, describing a promising method developed by the Bureau for ducing intricate shapes of high-purity tungsten industrially by oride reduction. The technique also may provide a means of lying a protective tungsten coating on less durable material. Deopment of this process to commercial scale would be an outstanding tribution to the Nation's space and missile program.

n conservation studies, the Bureau continued research on use of ge tonnages of so-called "depleted" uranium—material from which st of the fissionable isotope, U–235, has been removed in producing mic fuel.

Jranium-bearing steels produced in Bureau laboratories exhibited sile strengths higher than 300,000 pounds per square inch. A reau survey of the steel industry indicated that there is a large

*Mineralogists and petrologists use this ultraphoto microscope for examining min specimens at the Bureau of Mines' new research station, Fort Snelling, Minn.*

market for such high-strength steels. Therefore, some of the s plus depleted uranium that is accumulating might help supply t market, if the Bureau's laboratory work can be duplicated on a co mercial scale.

The Bureau also conducted a nationwide survey of the vacuu melting industry. Another study was made of the iron and st scrap industries in California and Nevada to determine areas wh research problems exist in using scrap.

Bureau researchers sought methods to conserve domestic cokin coal resources and to improve efficiency of iron-ore reduction pr esses. As a result, five private companies, adopting techniqu developed in the Bureau's experimental blast furnace, installed equ ment at their commercial furnaces to enrich the air blast with natu gas. First reports on these operations indicate savings of about percent in coke requirements with increases of as much as 20 perce in furnace efficiency.

Bureau scientists applying a melt-quench-leach process to Co rado rhodonite and siliceous manganese-bearing ores of Aroosto County, Maine, on a laboratory scale succeeded in extracting over percent of the manganese in these refractory materials.

An electrolytic solvent-extraction process developed in Bureau la oratories was successfully scaled up to produce nickel and cobalt better than commercial purity from Nicaro nickel-oxide sinter in continuous circuit.

Experiments in production of high-temperature alloys show marked success with electrowinning and electrorefining of vanadiu gsten, and molybdenum on a laboratory scale. Also discovered s a fused-salt electrolytic process for extracting chromium directly m low-grade domestic chromite-bearing materials.

Bureau scientists greatly improved a process developed earlier for trowinning tungsten from scheelite in a fused-salt bath and dis- ered that molybdenum can be separated from the tungsten metal duct in the process. This led to invention of an open-cell fused- t method for electrowinning high-purity molybdenum from the xide.

Extremely ductile vanadium metal—probably the softest ever pro- ed—was made by electrorefining an impure vanadium feed mate- l in a Bureau of Mines laboratory.

### *nferrous Metals*

Results of Bureau research on recovering copper from oxide and xed oxide-sulfide copper ores by a segregation process were used to ign a commercial plant that began operating in Arizona during year. Conditions were established for concentrating mercury m the concentrate by leaching. Progress was made in recovering imony, lead, zinc, and tin from primary materials by chloridization d leaching. Other metallurgical research included the vacuum ting of copper to form an air-cooled mold, studies of the thermo- tric properties of selected minerals, and the application of ultra- ic techniques to chemical and metallurgical processes.

In Bureau research on recovering and refining secondary nonfer- s metals, the yield of tin from hardhead by amalgam electrolysis raged about 90 percent with a purity above 99.9 percent. Work tinued in other phases of this program which included experi- nts in recovering lead and zinc from scrap, refining secondary mium, and developing instrumental methods for analyzing metal- gical reactions.

Favorable results were obtained in mining research on the use of cast concrete supports for mine openings to overcome ground-sup- t problems at a deep base-metal mine in Idaho. Progress was made o in applied physics research at open-pit and underground base- al mines. Additional data were compiled for improving a Bureau- eloped mining method that promises to double ore recovery at a ge underground copper mine in Michigan. Basic information was ained for use in developing methods to control noise in mining rations, to aid in rock-drilling and fragmentation research, and to p solve mine-drainage and water-control problems.

Antimony, copper, mercury, and tin occurrences in Alaska were mined and evaluated and Bureau reports were issued describing

the lode and placer tin deposits. A Bureau study of mercury
sources in the United States was completed and a bulletin report
the results was begun. In addition, a Materials Survey on merc
was published, and the Bureau reported on mining methods and c
studies at base-metal mines in Arizona, California, Colorado, Misso
Nevada, and Oklahoma.

Progress was made in the Bureau's program to recover alum
from domestic low-grade bauxite or nonbauxite materials. Baux
laterite from Oregon, Hawaii, and Arkansas, and anorthosite fr
Wyoming and California were tested. Cost calculations were p
pared for a number of proposed processes.

Research on the direct smelting of clays, or similar aluminum-s
cate materials to produce crude aluminum-silicon alloys, was descril
in a Bureau publication, and studies were undertaken to determ
whether these alloys can be upgraded to commercially pure alumin
or silicon.

Tests were begun on samples of various waste materials fr
primary aluminum plants. Preliminary results showed that w
some samples simple flotation techniques will yield high alumin
and fluorine recoveries with correspondingly high carbon rejecti

Two Bureau reports were published describing examinations
titanium resources in Oklahoma and Maryland. Five other publi
tions discussed Bureau research on the physical metallurgy of ti
nium, chlorination processes, and a technique for reducing titani
tetrachloride with high-surface sodium metal. The Bureau co
pleted tests on a 10,000-ampere electrolytic cell to evaluate the co
mercial possibility of its electrolytic process for recovering titani
from titanium scrap and other materials.

Experimental operation of this cell, in cooperation with the Gener
Services Administration, resulted in improved techniques and sign
icant cost reductions. Studies to develop suitable mold materials f
casting titanium and new electrorefining processes also progress
satisfactorily.

The Bureau conducted tests of single crystals of pure magnesiu
combined with small additions of other elements, to measure acc
rately their specific damping capacity under various stresses.

A Nationwide search for beryllium continued, and the Bureau pr
pared to use two mobile laboratories—one equipped with a spectr
scope and the other with a special “nuclear” detector—for qui
testing of rock samples. The Bureau also published a description
a field test it developed for detecting as little as 0.013 percent berylliu
in rock samples.

A beryl-flotation test plant was operated next to the Foote Miner
Co.'s installation at Kings Mountain, N.C., to test a Bureau improv

*part of its metallurgical research, the Bureau of Mines operates this experimental*
*rt for producing tantalum or columbium by the Kroll process.*

hod for recovering beryl and to determine the feasibility of ex-
ting this mineral from low-grade southeastern pegmatite deposits.
se deposits represent one of the largest known potential resources
eryllium in the United States. Results thus far have been en-
raging, and samples of the low-grade concentrate obtained are
g used in research to develop processes for extracting beryllium
al.

he Bureau persisted in its search for new commercial sources of
rium and intensified its development of improved methods for
rium detection and analysis. This element, once little used, has
me an important material in thermoelectric applications.

uctile columbium metal was prepared in a Bureau laboratory,
g the Kroll process. Purified columbium sponge was arc melted,
the resulting material machined, press forged, and cold rolled
thin, pliant sheets. After annealing in a helium atmosphere,
sheet could be bent easily with the fingers.

Cooperative research by the Bureau demonstrated the feasil
of separating a columbium-tantalum product from other meta
purities in euxenite by direct chlorination. Hafnium of a p
higher than heretofore attained was prepared by treating haf
tetrachloride with free chlorine. By this means the oxygen co
was cut nearly in half, with a corresponding reduction in
hardness. Research on producing ductile yttrium continued.
buttons of high-purity yttrium were hammer forged, vacuum
nealed, and rolled into foil-thin sheets that were successfully
welded under an inert atmosphere. A Bureau publication desc
the preparation of high-purity yttrium by metallic reductio
yttrium trichloride.

Results of 4 years' intensive research on rare earth metals
presented in a series of 14 Bureau reports published during the
Two of these described methods for analytical control in proces
five gave details of thermodynamic studies on various rare
compounds, and seven described solvent-extraction and ion-exch
methods for extracting rare earth metals and compounds
euxenite, bastnasite, and an euxenite-carbonate residue. A me
was developed for analyzing rare earth oxide mixtures and a si
and efficient technique was devised for extracting rare earth
pounds from bastnasite, a mineral rich in cerium and lantha
High-purity electrolytic cerium produced by the Bureau was te
and used in experiments by other research organizations.

Three Bureau publications on uranium exploration and mi
methods and costs complemented six earlier reports in this s
and were enthusiastically received by the industry. An impor
step towards eliminating radioactive uranium mill wastes was
through Bureau research on recycling of mill effluents.

### *Nonmetallic Minerals*

Research on recovering fluorine from low-grade siliceous fluor
ores included pioneering studies of the reactions involved in
molten defluorination of fluorspar. The relationship between
rate and defluorination of aluminum fluoride in a pilot plant ro
kiln also was investigated, and research was conducted on separa
the fluorspar and barite in complex ores by flotation. Mining met
and costs at a large fluorspar mine were studied.

Asbestiform minerals were synthesized and information was
tained on the fibrosity, occurrences, and anomalies of natural asbe
minerals. Advanced X-ray techniques were used to study the cry
structure of fluoramphiboles. Mining-methods-and-costs data
compiled on Arizona asbestos mines.

ıe Bureau conducted sulfur-utilization surveys in the midwestern northeastern States, during the year. Research on recovering ır through the decomposition of gypsum included test runs using -inch fluidized-bed reactor. Various absorbents, including me- c oxides and molecular sieves, were investigated as possible agents recovering sulfur gases from the reactor off-gas stream.

ureau researchers prepared elemental boron in the laboratory by cing boron trichloride with zinc, sodium, and lithium, and basic ies of boron's crystal structure continued.

formation was obtained on mining methods and costs at stone ries and mineral-aggregate mines. Fundamental research in ing included correlation of strain pulses produced in blasted with the properties of the explosives used. Other studies aimed termining the effect of explosive charges with varying diameters n placed in shot holes of fixed diameters.

brations generated by blasts at Wilson Dam in Alabama were rded at various distances to determine the order of magnitude of icle motion and to compare the performance of commercial seismo- hs with that of the Bureau's transducer mobile laboratory sys- This is the first step in new research to determine effects of ing vibrations on buildings and other structures near quarries.

sults of laboratory tests on samples from nine silica deposits were 1 in a publication entitled "Industrial Silica Deposits of the fic Northwest."

search on water requirements of metallurgical industries em- ized the role of common water impurities in flotation. Addi- of sodium and potassium to distilled water resulted in the flota- of more limestone and quartz than when these salts were absent.

cooperation with industry, the Bureau continued research on ıods of recovering commercial lithium-mineral concentrate from ıatite ores.

ındamental studies of various synthetic micas furnished accurate on their melting points, an evaluation of properties affecting preparation and uses, and basic information on crystal growth structure. One family of synthetic micas and related synthetic rals was found to have ion-exchange properties with potential ıercial applications. Research in cooperation with the General ices Administration developed a method for processing certain r-swelling synthetic micas into strong, flexible sheets with high ctric strengths.

ı important phase of research on super refractories was the de- ment and study of the operating characteristics of furnaces for y diffractometers. The effects of design of windings, thermo- le locations, lead positions, and other related factors were studied

to improve the accuracy of thermal measurements. These invest
tions permitted the measurement of thermal expansion in a nun
of pure rare earth oxides to a temperature of 1,300° C. Eno
information was obtained to extend the research to 1,500° C.

New chisels designed for the Bureau's phosphate-rock planer
field tested and found to have improved cutting characteristics.
search for new or more efficient processes for upgrading phosp
rock and for handling phosphatic slime continued. A study was be
to determine the feasibility of using statistical analysis on data
tained from phosphate-rock samples. Cavitational forces were inve
gated for use in possible techniques for fragmenting phosphate
and other materials.

Pioneering work by the Bureau resulted in the acceptance of bent
ite from a deposit near Yakima, Wash., for use in constructing
Wanapum Dam on the Columbia River. Several hundred thous
dollars will be saved over the cost of a suitable material from a m
distant source.

Under cooperative agreements with State agencies, clay, nephe
syenite, and other ceramic mineral occurrences in Washington
Oregon were examined and sampled.

Work continued on the complex problem of removing alkalies fr
submarginal Missouri fire clays. Reports were published on
fractory-clay deposits of Colorado and on sources of refract
raw materials and refractories markets in the South Central Uni
States. The Bureau-developed wet-attrition grinding process pro
more efficient than any of the commercial methods now used.

Research on abrasive and hard materials included the synthesis
borides and carbides by fused salt electrolysis, and flame plating
ceramic and metal surfaces with carbides, borides, and silicides.

Several deposits of kyanite and related minerals in the Pac
Northwest were examined, sampled, and evaluated, and some appea
to have commercial possibilities. Work on disaggregation of hall
sitic clays continued with encouraging results. High-pressure liq
extrusion was the most promising method developed.

## *Foreign Activities*

A study completed during fiscal year 1960 showed recent trends
world mineral production and revealed that the United States ra
first in output in 29 of 63 important commodities. The U.S.S.R.
in 8 and Canada in 3. However, the Communist world is scoring s
stantial gains.

Although the United States is still by far the world's leading ene
consumer, Russia has displaced her as principal coal producer.

*ureau of Mines engineer, representing the Department of the Interior, examines eral specimens in Antarctica. Field trips arranged by the National Science ndation resulted in investigation and sampling of coal deposits near Mount n.*

*arble slab, quarried in Antarctica by a Bureau of Mines engineer, is lifted from cy resting place by a Navy helicopter. The Department of Interior sent several esentatives to the south polar region in cooperation with the National Science ndation.*

Temporarily, at least, the U.S.S.R. also is first in iron-ore proc tion, but the United States still holds a substantial lead in steel out However, in this area too, the Communists are gaining.

The portion of the world's total steel produced by Iron-Curt countries has increased from 22 to 30 percent since 1953, while t supplied by free world nations has dropped from 78 to 70 perc Growing mineral strength of the Communist powers was studied in Bureau's foreign mineral program during the year and several pa on the subject were published.

The Bureau's foreign factfinding services helped in evaluat problems of domestic mineral industries arising from world surpl of certain commodities and contributed to the formulation of co tive measures. Data supplied by the Bureau were used extensi by Government agencies administering domestic import controls lead, zinc, and petroleum, also by domestic producers seeking to praise their market positions. The Bureau of Mines evaluated available sources of statistical information on supply-demand re tionships for the International Lead-Zinc Study Group.

Another special service was a comprehensive survey made by Bureau of potential mineral exports from foreign countries. study was requested in connection with barter programs for dispos of surplus agricultural products.

The Bureau's major responsibility in the foreign field is to prov consistently accurate and up-to-date information on mineral devel ments abroad. During fiscal 1960, this included foreign statisti tabulation comprising over 10 percent of volumes I and II of Bureau's Minerals Yearbook, review and distribution of over 50, mineral information dispatches from the United States Foreign Se ice, foreign governments and the United Nations; publication of timely studies on foreign minerals of interest to domestic produc and consumers; and response to numerous inquiries from Governm agencies and the public.

The Bureau also participated in an Antarctica field expedit sponsored by the National Science Foundation, sending an engin for a 2-month study of the environmental problems facing mine development in this region. Coal deposits near Mount Gran w investigated, and samples taken there were being studied in Bur and other laboratories at the close of the year. The Bureau's en neer supervised what probably was the first venture of its kind Antarctica. He directed the quarrying and transportation of th blocks of marble. The blocks, destined as cornerstones in th ɔels in Christchurch, New Zealand, were transported by helicopter waiting ship and were presented in appreciation for New Zealand's ›eration in the United States antarctic program.

welve Bureau technologists conducted technical-assistance proj- in Afghanistan, Colombia, Indonesia, Israel, Korea, Laos, Mexico, ı, and Taiwan. Three others completed short-term assignments 'anama and Mexico. Research on Philippine lateritic ores was ɔleted in Bureau laboratories and the possibilities of commercial luction were evaluated. Thirteen foreign technicians were in ıing at Bureau installations at year's end. Nineteen others had ıdy completed their assignments and returned to their respective tries under a program sponsored and financed by the Interna- ıl Cooperation Administration.

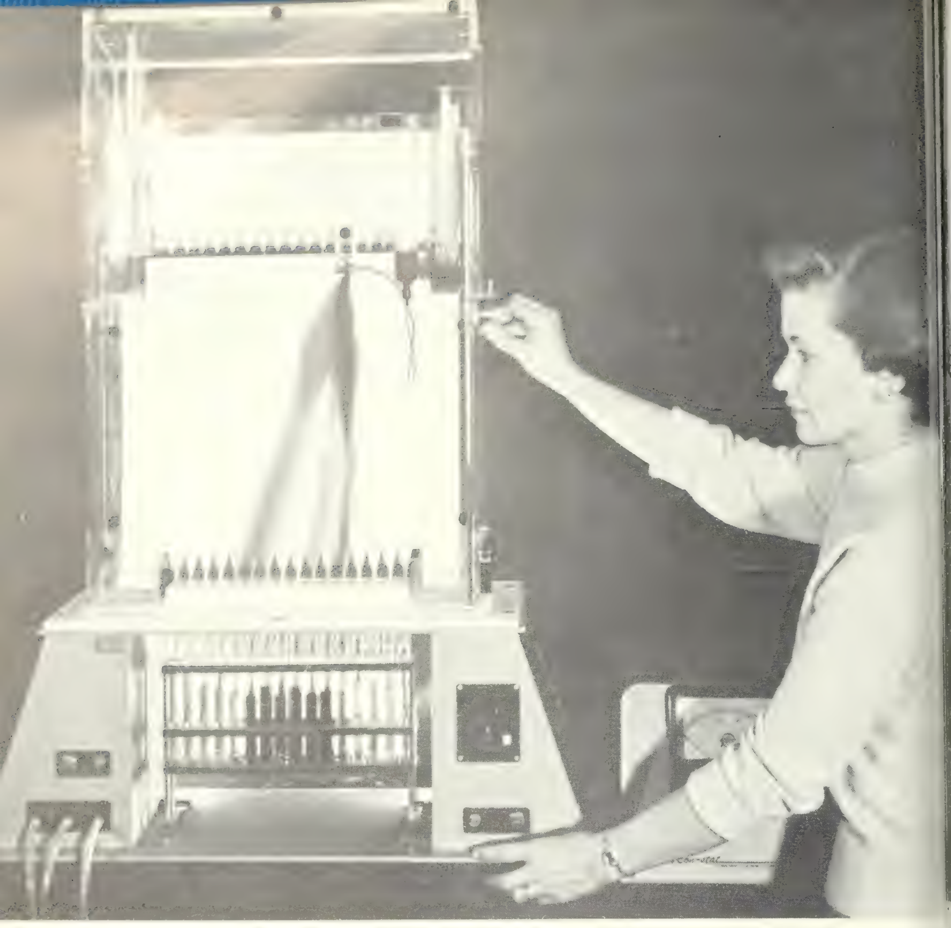
## *Petroleum and Natural Gas*

ıreau of Mines research in petroleum and natural gas made im- ınt contributions to the conservation of these essential fuels dur- he 1960 fiscal year.

Utah, the State Oil and Gas Commission established a policy ide well spacing and ordered practices designed to promote effi- recovery of oil and gas in the Greater Aneth fields, which have loped recently in the Four Corners region. This decision was l substantially on Bureau studies of the properties of reservoir in this major producing area—properties that affect both the ınt of oil that can be removed and the rate of production.

ıe Bureau's success in applying advanced mathematical theory to ıations of petroleum reservoirs in California will help solve prob- encountered in using water drives to increase oil recovery. The technique employs electronic computers, as well as conventional ɘdures, in many of the calculations, and provides correlations of ical and chemical properties with other data to permit economic ɘll as scientific evaluations.

ıreau-developed relationships between the properties and the com- behavior of natural-gas condensate fields systems are being used ·epare digital computer programs that will give rapid solutions fficult petroleum engineering problems encountered with high- ıure reservoirs. Such reservoirs are increasing in number as the ıstry drills to greater depths for oil and gas, and conventional ap- ɔhes to production problems are difficult, lengthy and expensive. ɔal computers facilitate this work and thus aid petroleum conser- n.



*This continuous electrophoresis apparatus has been installed by the Bureau*
*Mines for separating petroleum specimens in a high-voltage electrical field.*

Data obtained by the Bureau in pioneering field tests during Wor
War II were supplied to operators in a large southwestern gas fie
for use in connection with computer calculations of reserves. The i
formation obtained will help the operators choose efficient producti
procedures and should substantially increase ultimate recovery of ga

In the Appalachian region, the Bureau is investigating the flow
air-oil mixtures in vertical pipes. A model well has been construct
and studies were begun during the year to obtain information need
in designing lower-cost flowstrings and pipelines—which can mea
important savings in an area where the bulk of production comes fro
small companies or individual operators.

Research on oilfield brines produced sensitive analytical metho
capable of detecting several materials that are present only in min
or trace amounts. These methods are being used to determine sourc
of intrusive water, concentrations of recoverable metals, and also f
correlating properties of reservoir rocks and crude petroleum.

*space age has brought increased attention to Bureau of Mines pioneering*
*rch in safer handling and storage of liquid fuels. Here a large-scale con-*
*tion is studied in a Bureau laboratory.*

## *ndary Recovery*

the nearly depleted Cutbank field of Montana, waterflooding to
ver more oil shows greater promise as a result of Bureau research
ertain characteristics of the oil-producing formations.

ne Cutbank sand was found to have no swelling-type clay minerals,
pposed earlier, so fresh water can be injected for secondary re-
ry. In the Rocky Mountains fields, research on water-sensitive
s has helped prevent damage to oil-producing formations by
water drilling muds.

sults of Bureau field and laboratory tests showing that sodium
lyphosphate increases water-injection rates in secondary recovery
ations were used during the year in Northwestern Oklahoma,
e this chemical now is being applied successfully on 17 waterflood
cts. The methods employed were suggested by Bureau scientists.

dioactive gases were used by Bureau scientists to trace flow paths
gh naturally fractured rocks in the Spraberry Trend petroleum

*A two-story layout is used in a Bureau of Mines laboratory for studying the vert flow of air-oil mixtures in pipes.*

reservoirs of west Texas. This tracing, to determine the direction fractures before large-scale waterfloods, improves operations and covery. It is a conservation measure that has applications with ne methods, such as passing heat or light hydro-carbon fluids into bearing rocks to increase the flow of oil to wells.

## *Petroleum Chemistry, Refining, and Thermodynamics*

As part of cooperative studies with the Public Health Service on pollution, Bureau researchers burned various gasolines in an eng under simulated road conditions to determine how fuel composit and driving cycle affect the composition of exhaust gas.

he study showed that, during acceleration and cruising, the com-
ition of gasoline has little effect on the composition of the exhaust
; however, during deceleration and idling, the exhaust composition
lose to that of the fuel.

continuous flow paper-electrophoresis apparatus was adapted
m medical science and was applied with good results in studies of
de oil systems. This apparatus and method open new research
as in fundamental studies of petroleum's composition. Another
method, employing X-ray fluorescence, was developed for analyz-
hydrocarbons and hydrogen. It is now being extended to include
fur and nitrogen.

asoline compounds were tagged radioactively to learn which
med gum. Studies showed that, of the various hydrocarbons in
oline, aromatic types are the worst offenders. In addition, most
rogen compounds and certain sulfur compounds are active gum
mers.

ew thermodynamic research was begun on missile fuels and re-
le information was obtained on a spontaneously flammable liquid
minum compound. Studies were undertaken on several organic
on and fluorine compounds; important byproducts of this work are
erimental techniques developed by the Bureau and now being
pted by scientists of the propellants industry. Comprehensive
modynamic tables were completed for 100 petroleum sulfur com-
nds, and studies were conducted of minor constituents in Wilming-
, Calif., crude oil.

## *roleum Economics*

he Department of the Interior's Oil Import Administration makes
nsive use of the Bureau of Mines petroleum statistics. In addi-
to the forecasts required to set allocation levels, the Bureau now
piles historical data for use by Government and industry. Im-
t controls have emphasized the need for more detailed information
petroleum demand, and the Bureau's monthly Petroleum State-
t was expanded during the year to accomplish this.

## *Shale Research*

he Bureau analyzed samples from a 620-foot section of 25-gallon-
n oil shale—about six times thicker than expected—which was
nd in western Rio Blanco County, Colo. Also discovered were
k sections of apparently rich shale in the south-central Green
er basin and the west-central Washakie basin of Wyoming.

ureau laboratory experiments indicated that uranium oxides are
d catalysts for removing sulfur during the hydrogenation of shale

oil. The oxides employed were prepared from depleted uraniu substance available in large quantities as a byproduct of atomic en programs. The catalyst studies are among several being pursue the Bureau to help develop markets for depleted uranium, which only limited use at present.

Twelve technical publications on oil-shale research were issue the Bureau during the year, including: analyses of foreign oil sh composition of low temperature extracts, crushing oil shale, deve ment and experimental operation of three gas-solid oil-shale ret analyses of in-situ (in place) combustion methods and problems, cedures on organic nitrogen compounds and their reactions, cata evaluation, and test results in hydrogenating shale oil, and cata cracking of shale oil stocks.

## *Health and Safety Activities*

The year marked important progress in the Bureau's various he and safety programs. New knowledge was acquired concerning ards associated with increasing mine mechanization, and an intens educational program—including stepped-up use of visual aids demonstrations—conveyed practical safety guidance to large segm of the mineral industries.

Research on primary hazards moved ahead with promising techniques for evaluating and controlling mine roof, and experim were completed on a novel and effective method for fighting fires.

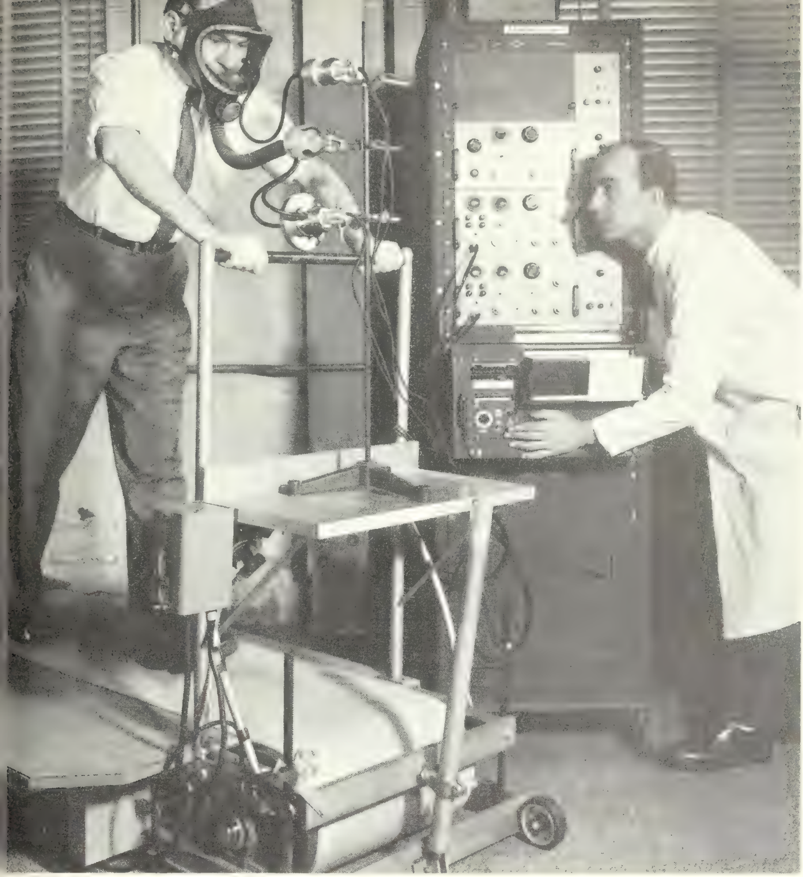
The entire mining industry recorded only one major disaster- a West Virginia coal mine—during the fiscal year, compared five such catastrophes in the preceding 12 months.

### *Work on Primary Hazards*

Advances were made in research to reduce mine-roof hazar traditionally the miner's most lethal enemy.

A commercial prototype of an articulated, self-propelled roof shi designed by the Bureau, was built by a mine-equipment manufact and now is being tested in a Pennsylvania coal mine. Prelimin studies indicate that the shield should be an effective aid in reduc roof-fall accidents at working faces in mechanized coal mines.

The practicability of sonar techniques for exploring struct characteristics of mine-roof strata was demonstrated during the y Bureau engineers and scientists are developing a smaller, more c pact sonar device for general mine use.



*ring a gas mask facepiece that is undergoing rigid tests by the Bureau of Mines,*
*experimenter walks a treadmill while a fellow researcher operates equipment*
*cord characteristics of the device.*

oof-bonding experiments continued, with polyester resins being
ed as substitutes for the more expensive epoxy resins. A new
hine capable of accurately controlling the resin mix was developed
Bureau researchers and is being tested in coal mines in southern
st Virginia.

oof-bolting studies continued during the year with special em-
sis on (1) standardizing pull tests; (2) determining operational
racteristics of various types of headed mine roof bolts, embossed
l bearing plates, and newly developed shell-type roof anchors;
developing simple economic devices for making quick visual
cks on roof-bolt tension; and (4) determining the effects of various
ting patterns and bolt loads on mine roof stability.

ooperative research with industry—aimed at developing a con-
uous methane-monitoring system with automatic power shutoff for
trically powered mining equipment operated in face areas—

reached the stage of testing under simulated mining conditions. system, developed cooperatively by two companies, was tested a Bureau's Experimental Coal Mine near Bruceton, Pa. Results far are inconclusive, however, and further tests in commercial n are planned.

The Bureau-designed, pocket-size methane detector was found able for coal mine use during the year. Principal advantage this instrument are its compactness, long filament life, and rea available power supply (standard flashlight cell). A recording- methane detector designed to give a continuing, instantaneous re of a mine atmosphere's methane content was developed by the Bu in cooperation with industry and was tested successfully at the perimental Coal Mine under conditions simulating operation continuous mining machine in a gassy atmosphere.

Research on ventilating continuous-type mining machines in coal beds was completed at the Experimental Coal Mine. Informa obtained from these tests and data gathered from field observat led to design by the Bureau and industry of a centrifugal fan wh when mounted on a continuous miner, will be capable of disper methane liberated from the working face at the rate of 30 cubic a minute.

### *Testing Equipment*

Improvements in mine mechanization continued to occur with markable frequency and again spurred demand for Bureau techn and testing services to determine permissibility of electric- and die powered mining machinery and similar devices.

During the fiscal year, Bureau approvals were issued under testing schedules for 17 continuous miners, 2 conventional min machines, 13 conventional loading machines, 13 shuttle cars, 17 dr ing machines, 2 power units, 1 utility truck, 2 rock-dust distributor distribution boxes, 3 air compressors, 2 mine pumps, 1 dust sample fan, 7 diesel trucks, 1 diesel carrier, 2 flashlights, and 1 miniat methane-indicating detector.

The Bureau also issued 180 formal and 472 informal extension approval, explosion tested 80 compartments, conducted 2,572 exp sion tests in natural gas-air mixtures, and flame tested 230 elec cables.

Five roof drills with integral dust-collecting systems were appro for use in coal mines, and 5 extensions of approval were granted. A 3 new approvals and 120 extensions of approval were issued respiratory-protective equipment.

*ew device for detecting combustible gases, developed by the Bureau of Mines, emonstrated here in an underground mine.*

### *alth*

Che Bureau's efforts to promote healthful working environments in mineral industries continued in analytical and investigative work gases, dusts, and respiratory protection.

Approximately 19,000 atmospheric samples—most of them collected ring Federal coal mine inspections—were analyzed during the year. her samples analyzed came from tunnels under construction, inspec- n of uranium mines, tests of respiratory-protective devices, sealed areas in coal mines, coal crop fires, tests of diesel-powered equip- nt in underground use, metal and salt mines, and miscellaneous field d laboratory investigations.

About 900 samples of dust and dust-source material were examined X-ray diffraction, emission spectrometry, microprojection, or chem- l methods in connection with environmental surveys at western tal mines and with other field and laboratory studies to determine st concentration, particle-size distribution, or composition. A high-volume sampler was designed, built, and approved as permissible collecting airborne dust.

A technique was devised and tested by the Bureau for using unmodified 2-hour, self-contained, oxygen breathing apparatus in pressures greater than atmospheric, such as those encountered in derwater tunnelling. Considerable progress also was made in devel ing equipment and procedures for evaluating respirators designe protect against high-toxicity dusts.

Environmental surveys were coordinated with medical studies the Public Health Service to evaluate the silicosis problem in me mining. With more than 30 surveys carried out since April 19 involving collection and examination of more than 9,000 airborne-d samples, the first phase of this study neared completion.

Increased emphasis was placed on inspecting uranium mines determine potential hazards from radon gas and its radioactive de products, and to evaluate other health and safety hazards. More th 300 determinations of radiation levels were made during these stud Bureau recommendations based on some 90 of these inspections c tributed to markedly improved conditions in mines on Indian lan the public domain, and lands controlled by the Atomic Ener Commission.

### *Explosion and Fire Prevention*

Research was completed on controlling underground fires with hig expansion foams; fires in 6 to 12 tons of coal were controlled duri experiments from distances up to 1,000 feet. Practical methods using foam to fight fires in operating mines were demonstrated industry.

By disseminating information and testing new and unusual mate als the Bureau furthered industry efforts to control dust explosio Specific data were obtained for powdered-fuel producers on the eff of an inert atmosphere in reducing explosion hazards of coal a lignite dusts. Explosibility of coal dust in an atmosphere containi low percentages of methane also was investigated.

### *Safety Education*

Widespread interest in the Bureau's newest course on fundament of coal-mine accident prevention stimulated efforts to train instructo in this phase of mine safety education. During the year the Burea various accident-prevention courses were completed by more th 14,400 mineral-industry workmen and officials.

Approximately 34,300 workers completed first aid and mine resc training. Emphasis continued on 100-percent participation in fi

*-scale excavations by private contractors often are involved in coal fire con- projects directed by the Bureau of Mines. This big trench, being backfilled incombustible material, was necessary in cutting off underground fire threaten- hool in background.*

and accident-prevention training, because Bureau records show improvement in safety is greatest at mines and plants where all loyees receive instruction.

wo new motion picture films as well as slides, posters, and other al aids to safety education were produced by the Bureau during l year 1960. Films in the Bureau's safety series were viewed by than 147,000 mineral-industry workers, and demonstrations of explosion, and mine gas hazards were attended by 120,000.

ureau employees participated in some 700 chapter and council ings of the Holmes Safety Association, attended by more than 0 workers, mostly coal miners.

### *ident Analysis*

eports from 30,000 operators in the mineral-extractive and re- l industries were used to compile the Bureau's injury frequency severity rates, which help these industries evaluate their safety gress and improve their accident-prevention programs.

pproximately 1,200 mines, quarries, and plants participated in 35th National Safety Competition sponsored by the Bureau.

Certificates of Accomplishment in Safety were presented to app mately 2,000 employees and officials of plants capturing top sa honors in the contest.

### *Control of Fires in Inactive Coal Deposits*

With Bureau guidance and assistance, 80 fires in inactive coa posits have been extinguished or controlled since 1949, when f were first appropriated for this purpose. Forty-four of these were on the public domain and Indian lands, and 36 were on pri property. An estimated 306 million tons of coal has been conse thus far under this program which also has prevented exte property damage and eliminated hazards to life in many areas.

During fiscal 1960, 12 fire-control projects were completed— the public domain, 1 on Indian land, and 7 on private property.

Another 215 uncontrolled fires in inactive coal deposits are kn to the Bureau. Of these, 103 already have been investigated and t control will be undertaken as appropriations permit and as pri matching funds are made available where required. Mainten work is done, as necessary, on completed projects so fires will rekindle.

### *Coal-Mine Inspection*

The eighth full year of Bureau coal-mine inspection work completed under the Federal Coal Mine Safety Act, which calls enforcement of certain provisions designed to prevent explosi fires, inundation, and man-trip and man-hoist accidents in m regularly employing 15 or more men underground.

The Nation had 10,618 active coal mines during the year. Of total, 1,208 were so-called title II mines, to which the mandat sections of the act apply. Smaller, title I mines, concerning w the Bureau is empowered only to make safety recommendati totaled 7,600. Auger mines and strip mines, also exempt from ma tory sections of the act, totaled 251 and 1,559 respectively.

During the fiscal year, the Bureau's force of Federal coal-m inspectors and safety engineers made 2,680 inspections of coal m subject to title II. They observed 7,401 violations of mandat provisions, many of which were corrected immediately and t required no formal action. The inspectors issued 1,005 notices sett a reasonable time for abating dangers, 199 granting time extensi and 969 certifying that dangers had been totally abated.

During the year, 101 orders were issued by the Bureau, requi withdrawal of men from all or parts of 58 mines; 51 orders at 37 mi e because of imminent danger, and 50 at 21 mines were due to ure to abate violations within a reasonable time. In comparison, vithdrawal orders were issued at 70 mines during the previous l year.

rders also were issued classing as gassy 14 mines previously conred nongassy. Three appeals were granted by the Federal Coal e Safety Board of Review, an independent agency, during fiscal for annulment of withdrawal orders issued for imminent danger State operating under a State-participation plan. The act does permit an appeal to the Director where such a plan is in effect.

ederal inspectors and safety engineers also made 8,549 inspecs of smaller title I mines (including 1,117 inspections at strip es and 185 at auger mines) and many electrical, ventilation, dust, ting, and related surveys. They also investigated fatal and serinonfatal accidents, mine fires, gas and dust ignition, and other rdous conditions.

reliminary Bureau tabulations show 292 coal-mine fatalities in ndar year 1959, compared with 356 in 1958. The fatality frecy rate per million man-hours of exposure dropped from 1.13 958 to 0.99 in 1959. However, the fatality frequency rate for irst 5 months of 1960 was again at 1.13.

ne major disaster (a single accident causing 5 or more deaths) rred during the fiscal year as a result of a fire in a West Virginia mine. Eighteen men were asphyxiated.

## *Helium*

urther progress was made in 1960 to assure that helium would be lable for the Nation's growth. Proposed legislation was resubed to Congress to make possible conservation of helium now going uel markets as a noncombustible component of certain natural s in the southwestern part of the United States.

May 1960, the House of Representatives passed H.R. 10548, and ear's end, a similar bill was reported favorably to the Senate by nterior and Insular Affairs Committee.

ne legislation would authorize the Government to purchase helium conservation storage and future use from up to 12 new helium ts financed, built, and operated by industry. The plants, to be ed on interstate pipelines carrying natural gas with a helium ent above 0.4 percent, would recover helium that otherwise would ost to the atmosphere when the gas is burned for fuel.

nese proposed industrial plants and the five Bureau of Mines ts now operating could recover approximately 88 billion cubic of helium in the next 25 years. Total demand during this

*Output of helium by the Department increased greatly during the year*
*completion of this new Bureau of Mines plant at Keyes, Okla.*

period is expected to be 36 billion cubic feet. Thus, 52 billion cu
feet could be conserved and stored underground for use after 1985

## *New Plant in Operation*

The Government's own helium-production capacity was increa
about 80 percent when the new Bureau of Mines helium plant
Keyes, Okla., began operations on schedule early in August 1959.

Operation of the $11 million plant began 9 months after the c
tract for its construction was awarded. The technical staff of
Bureau of Mines Helium Activity did virtually all of the proc
engineering as well as some of the engineering design for the Ke
plant. The low-temperature process used for crude helium extr
tion is patterned after that employed in the Bureau's other f
plants—but improved significantly.

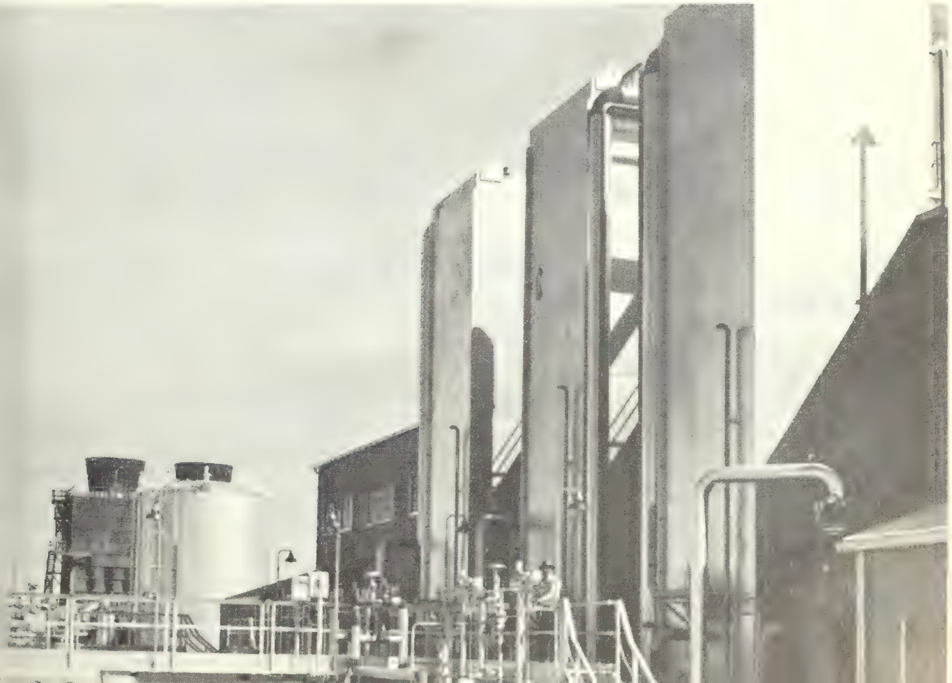
During fiscal year 1960, the Bureau's plants at Amarillo and Ex
Tex., Otis, Kans., and Navajo, N. Mex., also were in operation. Rea
vation of the Navajo plant, inoperative since the fall of 1958 for l
of helium-bearing natural gas, occurred early in the fiscal year wh
gas became available from a single well drilled in the area by a priv
company.

Helium was in abundant supply during the last half of the fis
year, for the first time since 1954. Production and shipments reac
new highs, exceeding 1959, the previous record year, by 76 percent a

ɔercent, respectively. Production was 624.2 million cubic feet,
ments, 420.1 million cubic feet. Excess was stored in the Govern-
t-owned Cliffside field. At year's end 214.6 million cubic feet of
um was stored underground, about 2½ times the maximum pre-
ısly held in reserve.

elium was used by the Air Force and Navy in rocket and missile
grams, by the National Aeronautics and Space Administration for
d tunnel and shock tube tests, by the Atomic Energy Commission
ıuclear reactor development, by the Weather Bureau to inflate
eorological balloons, by the National Institutes of Health in med-
research and for many other purposes. Commercial users em-
ed helium in shielded arc welding, leak detection, gas chroma-
aphy, low-temperature research, inert atmospheres for growing
on and germanium crystals, and in medical and scientific studies.
early 75 percent of the helium shipped went to Federal agencies
an estimated 80 percent of that delivered for commercial require-
ts was used on defense and atomic energy contract work. Conse-
ıtly, almost 95 percent of the helium consumed was utilized in pro-
ns of the Federal Government. Most of the remaining 5 percent
used for medical purposes, by colleges and universities, and in
arch supported by private industry.

*e helium separation units (right foreground) at the Department's new helium*
*at Keyes, Okla., reflect improved techniques developed by the Bureau of Mines*
*apturing this valuable element from certain natural gases.*



The Bureau's search for new sources of helium-bearing natural
continued. Samples of gas from wells drilled by private operator
eastern Utah and western Colorado were found to contain about 1
cent helium. The parent gas is merchantable as fuel, and furt
development by the companies is expected. Extent of the discove
has not been determined, and it is not known whether the new sour
comparable to those already known.

Properties and characteristics of helium-bearing natural gas
helium-gas mixtures were studied by the Bureau to improve proc
tion, purification and transportation methods. Much of this resea
is expected to be useful to private companies that may ultimatel
concerned with designing and building helium plants under the
posed Federal conservation program. New reports were added t
open file of information developed from research on extracting hel
from natural gas by low-temperature processes. Information
building and operating the Exell and Keyes helium plants was pla
on open file for consultation by firms interested in participating
the helium conservation program.

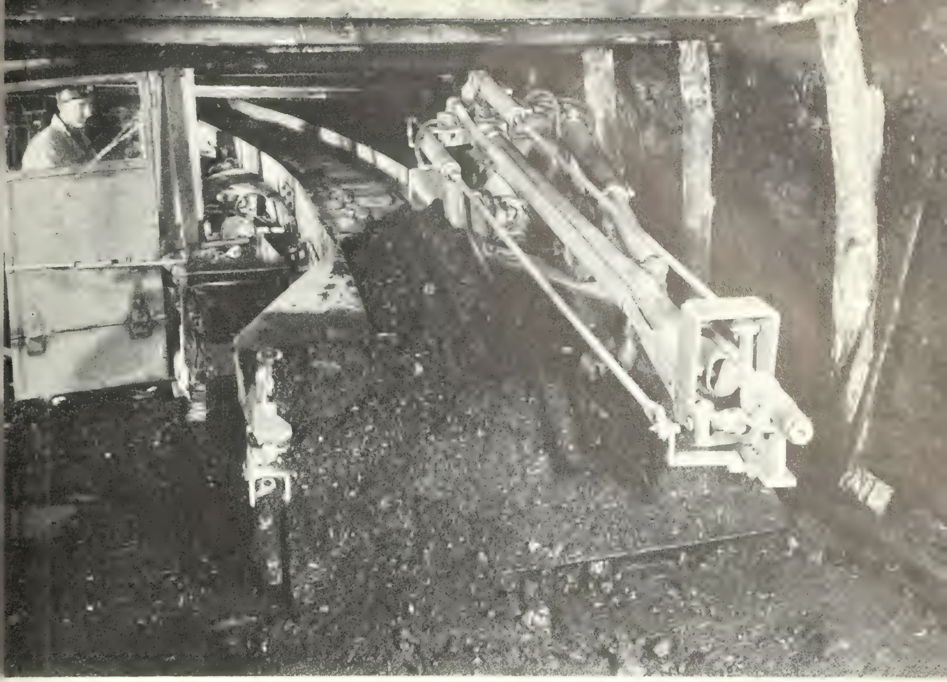
## *Bituminous Coal Activities*

The Bureau's programs to improve methods for extracting, proc
ing, and utilizing the Nation's vast reserves of coal continued,
significant developments on many fronts.

During the year, preliminary tests aimed at adapting hydra
mining techniques to American conditions indicated that a coal
can be cut effectively with high-pressure water. The Bureau
began research to develop an effective method for transporting
hydraulically, and undertook a study of methane emission at g
mines as a first step toward devising a method for degasifying c
beds before mining. Water infusion and use of horizontal boreh
through which the methane might be bled off in advance of min
both offer promise as methods for removing this explosive gas.

Coal-preparation research included tests of a dense-medium cycl
washer in cleaning fine sized coal, with particular emphasis on wa
ing an unsized feed without preliminary desliming. Other fac
investigated were the flotation mechanism and use of reagents, red
tion of sulfur by froth and kerosene flotation, and the performa
of new equipment. Tests with a pilot-size vacuum filter indicated t
it was possible to achieve significant reduction in filter-cake moist
without operational difficulty.

As part of a continuing evaluation of western coals, the possibi
of making metallurgical briquets from lignite char was investiga
The carbonization assay was modified to provide for carbonizat



*search in mining coal with jets of water progressed during the year. One setup s a hydraulic monitor (right) mounted on a regulation loading machine. As water cut into the bituminous coal the loading machine removed the coal m the working area.*

*ts in mining with powerful jets of water included those on anthracite. For s experiment, a block of anthracite was encased in concrete. Water jets cut ply into the hard coal and even penetrated the surrounding concrete.*

under pressure, a procedure that might be used in connection with combined gas turbine-steam cycle for power generation.

In preliminary tests aimed at gasifying lignite with oxygen i fixed bed under slagging conditions, runs were made with char, oxy and air at atmospheric pressure and higher to develop operability design data. This is the first time lignite char has been gasifiec this country in a system of this type.

Research continued on the Fischer-Tropsch synthesis—one met of making synthetic liquid fuels or pipeline gas from coal. A var of catalysts was prepared and tested, including the Bureau-develo carbon-expanded metal (CEM) catalyst. Work also progressed establishing specifications for sulfur tolerance in synthesis gas. hot-gas recycle system, one of several processes under development the production of pipeline gas, was tested on a pilot scale.

In hydrogenation experiments, two promising developments producing pipeline gas from coal at high temperatures were dem strated in a Bureau laboratory. At 2,400° F., 50 to 60 percent of coal was converted into pipeline gas at atmospheric pressure. Us lower temperature—about 1,500° F.—and higher pressure—6, pounds—a conversion of 70 percent was achieved.

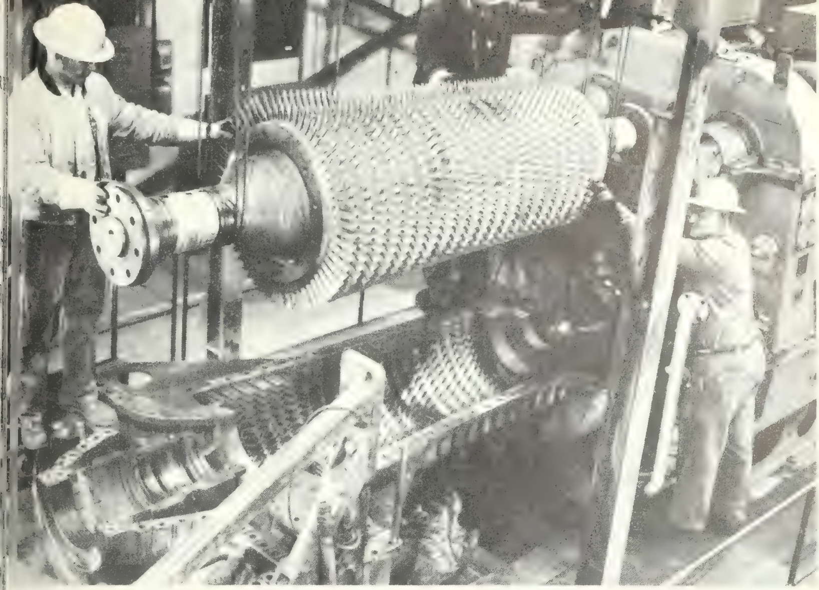
A Bureau-developed technique for overcoming lignite's tendency freeze during winter transit by adding partly dried lignite to the m product, began undergoing evaluation for industrial use.

In a study of how nuclear radiation affects the structure and pr erties of coal, selected bituminous coal samples were exposed to clear bombardment, then compared with unexposed samples. though most of the tests indicated no significant change, there was some instances, an increase in coal hardness, also an apparent mi change in the coal structure.

The Bureau continued studies on the correlation of furnace p formance factors, external boiler tube deposits, the combustion coal in suspension, fluid dynamics, and the incineration of combu ible wastes.

Research on the use of ultrafine particles of coal as a possible f for coal-burning gas turbines led to the development of a feeder ca ble of supplying ultrafines to a burner uniformly at 1 to 5 pound minute. Work with the coal-fired gas turbine loaned to the Bure by industry centered on design changes, repairs, and installation.

Investigations continued on the effects of coal properties and c oven operating conditions on the properties of coke. In the Micu ASTM correlation program, tests with samples of furnace, found and other cokes from commercial organizations indicated high c relation between the properties of industrial cokes and those produ by the BM–AGA method.



*or for a coal-fired gas turbine, being studied by the Bureau of Mines, is removed overhaul.*

## tuminous Coal Economics and Statistics

Production of bituminous coal and lignite continued downward for third successive fiscal year, hitting a yearend level about 2½ per- t below fiscal year 1959. However, this was due largely to effects the steel strike during the early part of the year. Output actually ned upward in the last half of fiscal 1960, notwithstanding a decline coal exports.

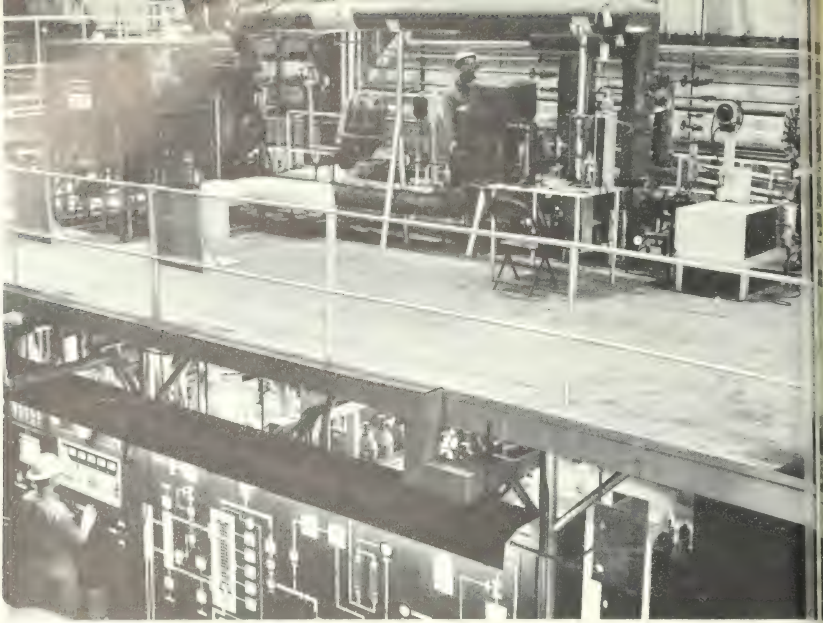
Coal consumption at electric power utilities continued its upward nd, increasing 6 percent during the year.

Comprehensive analyses of bituminous coal and lignite distribution d marketing were begun by the Bureau to delineate the extent of ent shifts in coal distribution patterns and to clarify coal's posi- n in the competitive energy market.

Besides assembling and publishing information on the rapidly nging pattern of international coal trade, the Bureau informed ner Departments on coal developments abroad. Detailed informa- n also was supplied to defense agencies for use in planning solid els mobilization.

## plosives and Explosions

A statistical method developed by Bureau of Mines explosives re- rchers was used successfully during the year to study the effect of nmonium-nitrate particle size and type of carbonaceous component incendivity. In addition, field and laboratory studies of toxic me production and bullet sensitivity of ammonium nitrate-fuel oil



*This simulated nuclear reactor for studying the gasification of coal has been*
*by the Bureau of Mines.*

blasting agents provided a basis for further recommendations on
storage and underground use of this material. Fundamental resea
in cooperation with other Government agencies yielded new infor
tion on spherical detonation, also on electrical and magnetic eff
accompanying detonation and deflagration to detonation transiti
in propellants and explosives.

Investigations conducted for a Federal defense agency on fire
explosion phenomena associated with liquid hydrogen led the Bur
to prepare a table of recommended mass-isolation distances for t
hazardous high-energy fuel. A study of air entrainment in comm
cial gas burners was undertaken in cooperation with the American
Association. Several disastrous fires, explosions, and potentially h
ardous situations were investigated.

## *Air Pollution*

Cooperative air-pollution research with the Public Health Serv
continued. Favorable preliminary cost estimates for a Bureau-
veloped method of removing sulfur dioxide from flue gases led to
sign and construction of a pilot plant for testing the process furth
The Bureau's delineation of relationships between automobile fu
and exhaust compositions attracted interest from many concerned w
air-pollution research. Bureau work on both catalytic and flame aft
burning of exhaust gases assumed increased importance with m
general acceptance of the automobile as a major factor in urban
pollution.

## *Anthracite Activities*

he Bureau's anthracite research program was devoted primarily leveloping new or improved methods to reduce mining costs, imving utilization and preparation practices, and carrying out the eral Government's responsibilities under the joint Federal-Comıwealth of Pennsylvania Mine-Water Control Program.

ests were conducted in cooperation with industry on a pitch mining ject using a borer-trimmer type of continuous miner, a 2-foot unground auger equipped with a 4-foot reamer, and other auxiliary ipment. Continuing experiments in longwall mining, the Bureau alled an imported Eickhoff drum shearer-loader at a coal face and an testing. However, bad roof conditions developed and, after ral roof falls, the project was stopped. Tests on eight samples of ıracite from the Bureau's hydraulic mining test site demonstrated feasibility of breaking this hard coal with water jets. Plans are erway to investigate the techniques and economics of mining ancite hydraulically.

esearch was speeded on the vertical, hydraulic transportation of ıracite. A variable-speed pump was installed at the Anthracite earch Center, Schuylkill Haven, Pa. Limited tests already have wn that nut-sized anthracite can be moved vertically in a pipe ımn. An alternate method also has been designed in which the soldo not pass through the pump, but enter the high-pressure hyılic system through a lock-hopper feeding mechanism. Construc. of this mechanism for testing will begin soon.

ı research on the chemical and physical properties of anthracite, nfrared spectrophotometer is now being used to permit a more damental examination of the nitric acid oxidation products of ancite.

ıvestigations are underway to determine the effects of high-freıcy induction and dielectric heating on anthracite.

esearch was continued on producing an agglomerated anthracite allurgical fuel. An experimental metallurgical stock column for ssure-drop studies was installed at the research center and, prenary to large-scale tests, studies will be made in this apparatus to rmine optimum shape and related properties of an anthracite allurgical fuel.

esearch on hydrogasification of anthracite was continued, with hasis on the mechanism and kinetics of the hydrogen-anthracite tion.

he breakthrough of the Susquehanna River into mine workings anuary 1959 prompted reevaluation of a major part of the Fed-State Anthracite Mine-Water Control Program. Three approved pumping installations were cancelled and plans were begun to tran the pumps to other locations. Four new projects, with a total mated cost of nearly $800,000, were approved.

Annual economic and statistical surveys were issued covering duction, distribution, stocks, wholesale mine prices, hours and earni and other aspects of the anthracite industry.

## River Basin Activities

Conservation and development of water resources are of increa concern to mineral industries and to the Nation, and the Burea Mines cooperates with State, private, and other Federal agencies find solutions for mineral industry problems related to water suppl

Mineral engineering consulting services, investigations, and revi of reports given other Federal agencies in connection with water source development included 32 for the Federal Power Commission for the Corps of Engineers, 64 for the Department of Agriculture, 9 for the Bureau of Reclamation.

The Bureau also served in an advisory capacity to departme members of the Southeast and the Texas Study Commissions.

Mineral reconnaissance surveys were completed for the Burea Reclamation on seven proposed reservoir sites in the Colorado R basin and a special mineral appraisal was made on a coal deposit a proposed dam in Utah. In addition, the Bureau of Mines furnis information for the Bureau of Reclamation for use in a condemna proceeding concerning land acquisition and appraisal of a Utah deposit.

Professional engineering advice was given the Federal Power C mission counsel and the Department's counsel concerning applicat by the city of Seattle and Public Utility District No. 1, Pend Or County, Wash., for hydroelectric projects in the Metaline F Mining District.

The Bureau cooperated with several agencies in analyzing infor tion concerning a $4-million damage suit resulting from percolat irrigation waters at a diatomite deposit.

### Missouri Basin Project

Nine preliminary reports and one Bureau bulletin were comple in fiscal 1960 under the cooperative Missouri River basin proj Subjects included petroleum and natural gas development, recov of water-borne mineral wastes, lignite storage techniques, and m rials for the chemical industry and for canal lining materials. A c prehensive report was completed on 271 oil and gas fields of Wyom ineral reconnaissance surveys were completed for the Bureau of amation on five proposed reservoir sites.

Bureau inventory showed that nearly 19 million pounds of watere mineral wastes—about 75 percent ferrous and zinc sulfate and ic phosphate—was lost in 1958 in the lower Missouri basin. Ways being sought to salvage and use these valuable minerals.

## *Special Economic Studies*

ineral-supply problems were the subject of special economic ies during fiscal 1960. A major study of the petroleum industry completed for the Office of Civil and Defense Mobilization, and rs were presented at professional meetings on problems of petro- supply and demand. Problems of domestic mineral industries kept under constant analysis to facilitate Department of the Inr evaluation of congressional proposals.

reparations were made for large-scale multilateral tariff negotias scheduled to begin in early 1961 and for negotiations on the new rnal tariff of the European Common Market, beginning in Sepber, 1960. Detailed studies, conducted for these conferences, dep for many commodities the historical pattern of world trade, the cture of world prices, and the effects of changes in prices and naal income upon consumption and imports.

n interrelated set of price indexes also was developed, measuring nnual changes since 1925 in (1) average at-mine value of mineral luction; (2) average prices of refined primary mineral products; (3) implicit price changes, relating the Index of Physical Volume tal value of mineral production. A lack of price indexes has hamd the economic study of the mineral industry, and these new ins, to be published in the 1960 Minerals Yearbook, will give such ies a firmer foundation.

## *Public Reports*

fiscal year 1960, Bureau scientists and engineers wrote 754 pubeports on research in metallurgy, mining methods, health and ty, explosives, and other subjects concerned with conservation development of minerals and the saving of life. Of the pubions issued, 136 were reports of Bureau investigations or orig- research, 71 were information circulars on new developments in stry, 7 were bulletins presenting results of completed programs lescribing major phases of continuing research, 135 were pret chapters of Bulletin 585, Mineral Facts and Problems. A new

edition of this popular "mineral encyclopedia" was issued during
year, giving an up-to-date analysis of minerals and their outl
including information on technology, uses, reserves, production,
sumption, foreign trade, prices and research. Bureau authors
prepared 319 articles for presentation at scientific meetings or
publication in scientific, trade, and technical journals.

National interest in the industry-sponsored sound motion pict
circulated by the Bureau remained high. Showings of these i
mational films, telling the story of America's mineral heritage
taled 222,786, and they were seen by group audiences of 11,431
Approximately 5,500 prints were in circulation during fiscal 1
Several older films were removed from circulation under a prog
for keeping Bureau films up to date.

Two new films—"California and Its Natural Resources" and "
Story of the Modern Storage Battery"—were added to the Bure
library of educational motion pictures during the year. Both
entirely new versions of subjects that have long ranked high in p
larity. At year's end, work was well along on a new film cove
the resources of the Nation's 49th State—Alaska.

# *Office of Oil and Gas*

**Capt. Matthew V. Carson, Jr. (USN),** *Director*

★ ★ ★

E DEPARTMENT'S OFFICE of Oil and Gas is a focal point
etroleum information and provides staff services and technical
ance in carrying on petroleum and gas activities in the Govern-
and in international petroleum programs in which the United
es participates.

## *g-Range National Policy*

ckground upon which Government can base long-range national
ity policy for petroleum has been developed for the Office of Civil
Defense Mobilization through the cooperation of the Department
e Interior and the work accomplished by its Office of Oil and Gas,
ogical Survey, and the Bureau of Mines. In this connection, the
rtment has submitted to OCDM a report and conclusions, together
six technical papers which provide an evaluation of United
es and free foreign petroleum resources, crude oil productive
city, and oil requirements—under nonemergency conditions—
ugh 1975.

## *rgency Planning*

ajor strides have also been made in domestic planning to cope with
ible oil and gas problems under emergency conditions of the
ear era. Civil defense and defense mobilization oil and gas pre-
dness plans were approved this year by OCDM.

ased on Office of Oil and Gas staff work, these mobilization plans
orth the responsibilities and emergency actions required in man-
nent of petroleum and gas resources to meet essential emergency
irements. Among the items considered essential for survival
Distillates, gasoline, kerosene, liquefied petroleum gas, lubricat-

ing oils, residual fuel oil, and natural and manufactured gas.
ing the year, supply and requirements data for these produ
well as information regarding facilities for their productio
handling were furnished the National Damage Assessment C
Leaders in industry and Government are being briefed on na
emergency oil and gas plans at OCDM-Interior conferences i
eight OCDM regions.

The Petroleum and Gas Unit of the Department of the In
Executive Reserve has been established at the regional level.
sequently, it will be enlarged to include a national headquarters.
Reservists serve in Government in time of national crisis, they r
orientation and training in the responsibilities they would assu
members of an activated emergency petroleum and gas organiz

Assistance was requested and obtained from the National Petr
Council in establishing a roster of competent personnel as cand
for the regional and national units of the Executive Reser
studying and reporting upon the use of radio and radar in t
and gas industries, and in making a survey and furnishing da
the capacities and precise locations in the United States of petr
storage in excess of 25,000 barrels.

Coordination of United States defense preparedness planni
oil matters with the North Atlantic Treaty Organization was ca
on through participation of the Office of Oil and Gas in the work
NATO Petroleum Planning Committee and its working group

Because of the far-reaching effects of oil operations abroad
peace and stability of the free world, the Secretary of the In
has expanded the Foreign Petroleum Supply Committee so t
Readiness Subcommittee could be established to undertake worl
petroleum studies as required by the Department of Defense in
ning to cope with possible major emergencies. In the interin
tain surveys, covering production, refining, transportation, and
leum products requirements in friendly foreign nations have
undertaken by the OOG for the Defense Department.

## *State and Industry Liaison*

The Office of Oil and Gas has kept abreast of conditions a
velopments in the domestic petroleum and gas industries. Th
rector has represented the Department at meetings of the Inte
Oil Compact Commission where information on conservatio
grams of mutual concern to the States, the industry, and the G
ment were presented.

During the year, participation of the Director and technica
at industry and government meetings has promoted better

ding of progress and problems in domestic and worldwide petro- operations.

chnical assistance has been rendered on a day-by-day basis to rnmental departments, agencies, and Congress. Proposed legis- n has been reviewed for departmental use in reporting to com- ees of Congress. The technical staff has continually helped the ic by providing petroleum and gas information in response to ests.

# *Office of Minerals Exploration*

**Frank E. Johnson,** ***Acting Director***

★ ★ ★

THE OFFICE OF MINERALS EXPLORATION was e lished by the Secretary of the Interior on September 11, 1958, to vide Federal financial assistance to exploration for domestic mi reserves, excluding organic fuels, under Public Law 85–701.

OME also administers contracts in force and certified project maining from the exploration program conducted from mid-19 June 30, 1958, by the Department's former Defense Minerals Exp tion Administration.

## *Program Functions*

The Office of Minerals Exploration offers financial assistan firms and individuals to explore their properties or claims for o more of the 32 mineral commodities listed in the OME regulat This help is offered to applicants who ordinarily would not under the exploration at their sole expense and who are unable to ob funds from private sources on reasonable terms.

The Government will contract with an eligible applicant to pa to one-half of the cost of approved exploration work as it progre The applicant pays the rest of the cost, but his time spent on the and charges for the use of equipment which he owns may be ap toward his share of the cost.

Funds contributed by the Government are repaid by a royalt production from the property. If nothing is produced, there obligation to repay. A 5-percent royalty is paid on any produ during the period the contract is in effect; and if the Govern certifies that production may be possible from the property, the ro obligation continues until the Government's contribution is re interest, or for the 10-year period usually specified in the con- The royalty payment applies to both principal and interest, but er exceeds 5 percent.

## Operations

erest in the program has continued at a high level as indicated e more than 1,200 inquiries received during this fiscal year.

ring this year, 38 applications were received requesting financial ance for exploration work estimated to cost $3,929,912. These the total for the OME program to 95 applications for explora- exceeding $7,500,000 seeking deposits of 20 minerals in 22 States. ns taken on these applications are shown in the following tabu- :

*Disposition of OME applications*

| Action | Number | |
|---|---|---|
| | Fiscal year 1960 | Total |
| Received | 38 | 95 |
| Denied | 32 | 44 |
| Withdrawn | 8 | 15 |
| Contracts executed | 11 | 19 |
| Pending on June 30, 1960 | | 17 |

11 contracts executed during fiscal 1960 brought the total of ed contracts to 19.

19 OME contracts in force are distributed over 11 States and operations valued at $796,260. Under the contracts, explora- planned or underway to develop additional reserves of mercury, inc, copper, fluorspar, and mica.

## A Operations

recoverable mineral commodities found on the 391 certified A projects are estimated to have a gross value of more than nillion based upon market prices in effect at the close of the fiscal Important additions to this estimate are anticipated as the 15 A contracts remaining in force are completed.

alties collected incident to the sale of minerals found under the A contracts continued at a relatively high rate during fiscal In this year $444,083 was received bringing the total since the of the program to $3,571,146. Fifty-three projects have repaid l the $1,617,647 contributed by the Government.

*Summary of DMEA contract data*

| Contracts | Fiscal 1960 | | | Program through June 30, 1960 | | | |
|---|---|---|---|---|---|---|---|
| | Number | Total value | Government participation | Number | Total estimated costs | Government participation | Go r par tion |
| Contract amounts as originally executed | | | | 1,159 | $50,547,489 | $31,056,412 | |
| Amendments which changed contract amounts | 2 | −$31,691 | −$17,882 | 220 | 6,223,002 | 3,748,831 | |
| Amounts as amended | | | | | 56,770,491 | 34,805,243 | $23 |
| Certified as discoveries | 17 | 2,460,147 | 1,365,433 | [1] 391 | 27,904,078 | 17,389,196 | 14 |
| Terminated without certification | 11 | 1,376,551 | 743,454 | 672 | 23,212,363 | 14,319,586 | 8 |
| Canceled without Government expenditures | 2 | 75,060 | 45,680 | 82 | 2,208,613 | 1,350,070 | |
| In force as of June 30, 1960, not certified | | | | 14 | 3,445,437 | 1,746,391 | |

[1] Includes one contract in force and two contracts certified though canceled.

# *Office of Minerals Mobilization*

**O. W. Bilharz,** ***Director***

★ ★ ★

OFFICE OF MINERALS MOBILIZATION has the responty of carrying out the Department of the Interior's functions ng to national defense preparedness in metals, minerals and fuels, and for procurement, transportation and distribution of fuels consistent with the national emergency fuel program, as ated by the Office of Civil and Defense Mobilization.

ring fiscal year 1960, the office continued to evaluate the extent ich production by the domestic minerals, metals and solid fuels tries and imports of minerals and Government stocks of metals ninerals would be able to meet essential civilian and military rements under mobilization conditions.

ring fiscal year 1960, supply evaluation studies were completed rysotile asbestos and celestite. A mobilization base-type study ompleted on oxygen-free copper and a review was made of the re mobilization base study and the antimony study. An asbestos sal study was also completed.

o revised evaluations were made of high temperature and special rty materials. These reevaluations are made biannually at the st of the Office of Civil and Defense Mobilization.

## *nse Stockpiling*

Office advised and assisted the Office of Civil and Defense ization in matters pertaining to Government stockpiles, and diss from Government inventories of minerals and metals in excess ense requirements, and worked with that agency on the minerals, s and solid fuels portion of the National Plan for Civil Defense efense Mobilization.

fiscal year 1960, OMM assisted OCDM in the National Bomb ge Assessment program by assembling, coding and keeping cur-

ent, input data on minerals, metals and solid fuels for use in
puting machines for assessing probable bomb damage of thes
dustrial facilities in the event of an enemy attack.

### *Executive Reserve*

During the year the Office continued to recruit for industry offi
to serve in the OMM unit of the National Executive Reserve. Du
this period eight additional reservists were designated by the S
tary to serve in this capacity. Fifty-seven reservists had been enr
up to the close of the fiscal year.

The Office maintained a complete duplicate set of files and c
ments for use at the Relocation Center in the event of an emerg
It also participated in furnishing an Interior representative at
OCDM relocation site during various periods of the fiscal year.

The Office also participated in the Department's program for t
ing key industry personnel as instructors in radiological defens
supplying a member of the teaching staff. During the period u
review twenty industry technicians were trained.

# *Office of Geography*

## Meredith F. Burrill, *Director*

★ ★ ★

E OFFICE OF GEOGRAPHY provides research and other services for the interdepartmental Board on Geographic Names the Secretary of the Interior in the field of foreign nomenclature.

uring the year over 200,000 names in several European and tic countries were processed for standardization by the Board gazetteers containing more than 250,000 entries for Turkey, iania, Ceylon, and the Federal Republic of Germany and East in were prepared for publication. In addition, about 40,000 es were edited on maps or otherwise supplied to users as the re- of inquiries.

ooperation of the Permanent Committee on Geographical Names British Official Use was obtained in the rendering of about 3,500 es in the Aden Protectorate by the BGN/PCGN system for the sliteration of Arabic.

udies were made of nomenclature source materials and policy lems of 38 countries and comparable areas for use in name lardization for Federal agencies, and transliteration systems were yzed for several nonroman-alphabet languages.

urther progress was made in studies of the type classification of raphic features, the meanings of generic parts of names, and lefinitions of terms used to designate the features to which names applied.

## *Board on Geographic Names*

### William G. Watt, *Chairman*

### Meredith F. Burrill, *Executive Secretary*

ie interdepartmental board on Geographic Names was estab- d in 1947 to provide a central authority for standardizing raphic names for use by the Federal Government. It is com- d of representatives of the Departments of Interior, State, Army, y, Post Office, Agriculture, Commerce, and Air Force; the Gov- ient Printing Office, the Library of Congress, and the Central lligence Agency.

The Department of the Interior provides staff facilities and
tains the records of the Board and its committees. Foreign
staff functions are performed by the Office of Geography, do
names functions by the Department's Geological Survey.

During the year 1,444 domestic geographic names were consi
and 1,391 were approved for use on Federal documents. Thre
containing decisions on 1,130 names were published, and a f
list containing 515 decisions was assembled for publication.

# ffice of the Assistant Secretary
# *ublic Land Management*

ger **Ernst,** ***Assistant Secretary***

* * *

E ASSISTANT SECRETARY for Public Land Management, lischarging the Secretary's duties in that field, directs and super- s the Bureau of Land Management, the National Park Service, Bureau of Indian Affairs, the Office of Territories, and the Alaska lroad.

he last-named agency was designated as a separate bureau during fiscal year, and removed from the jurisdiction of the Office of ritories. The Railroad's revenues for the year exceeded $14.5 lion, and it was not necessary to request Congress to appropriate money for the line. After several years of negotiations, the Rail- l sold its interest in a power plant in Anchorage for approximately million. The Alaska Railroad, a leader in the industry in con- erization freight, continued to show gains in that field.

evenue freight tonnage was down 1.89 percent from the preced- year, but still approximated 1.25 million tons. Revenue passen- totaled 76,991, a drop of 3 percent from the prior year.

ore than $371 million in revenues were received from the public ain managed by the Bureau of Land Management, the highest me in history for a single year. The 1960 revenues pushed the eau's total receipts past the $2.2-billion mark; more than half of has come in during the 1950's. The public lands yielded millions oard feet of timber, forage for millions of animals, wild and estic, and enough oil to heat about 6 million homes. In the field ajor land legislation, the Department requested introduction of . 7042, or the "Public land Urban and Business Sites Act," would authorize the sale of up to 1,280 acres to counties, municipa and individuals for urban or business purposes. Counties and m pal governments would have preference rights. Sales would be appraised fair market value. Individuals and nongovernr entities could purchase only at public auction.

In areas administered by the Office of Territories, the past year climaxed a decade notable for advances in self-governmen 1950 Congress enacted organic legislation for Guam. And las witnessed the appointment of Guam's first Governor of Guam ancestry. Another first in the Pacific was the granting of legis authority to American Samoa through the secretarial approval first constitution. The Territory's native legislative leaders g broader knowledge through participation in national confer Air and surface transportation improved in Samoa. The Terri economic trends were encouraging. Samoan local revenues re the million-dollar mark for the first time.

In the Trust Territory of the Pacific Islands, administered l United States for the United Nations, gains were made in the t preparing the 73,000 Micronesians for a larger role in the respo ities of government, economic growth, and public welfare. N won promotions to higher jobs. Through a pilot fisheries proj Palau and a new fisheries cooperative in Ponape, the production and export of fish soared over any previous year. Cacao produ was also pushed. Coconut rehabilitation continued. Educa gains were highlighted by the dedication of the new Pacific Is Central School, with an enrollment of 140 students from all dis of the Trust Territory.

Revenues in the Virgin Islands were the highest in history. revenues increased 38 percent of fiscal 1959. The Territorial De ment of Tourism and Trade estimated that more than 200,000 vi came to the islands. The rapid tourist increase is straining elec facilities, but by next year a combination saline distillation and tricity-generating plant is expected to be operating and meeti demands.

The Bureau of Indian Affairs put new stress on its drive to p American Indian citizens with adequate opportunities for pe development and growth so they can take whatever place they c in the larger fabric of our national life. Record school constr projects provided nearly 2,000 additional pupil seats. In-servic cational programs provided teachers, guidance personnel, and a istrators with a deeper understanding of the needs of Indian e tion and better ways to meet these needs. Total income for In from oil and gas development of their lands exceeded $47 mi Other mineral income was more than 2.6 million dollars. The v

value of timber sales hit a new high. Additional jobs were cre-
l by the timber development. The expanding tribal sawmill pro-
ns were evidence of awakening interest among Indians in the
agement of their forests. During the year the Bureau made its
loan to a tribal organization for the purpose of attracting indus-
l development. The tribe matched the loan with its own funds,
t a factory, and leased it to a firm. The industry will furnish em-
ment to about 150 persons, with Indians having a preference.

early 66 million visitors came to the various areas administered by
National Park Service. It was the fourth year of the 10-year
gram known as Mission 66, a program designed to improve and
ect the national park system culminating in 1966, the golden an-
rsary of the Service. Nine new visitor centers were opened dur-
the year. Facilities were expanded to guide the visitors along
lsides and trailsides. Archeological, geological, and historical
arch continued. The national swing to family camping in park
s continued to mount. Visitor patterns also showed that more
more Americans are visiting these areas in what used to be con-
red "off" months, so that services in additional areas must be
vided more on year-round rather than seasonal basis.

he Department also asked Congress to establish three national sea-
e areas, to preserve them for the public before they are lost for-
to private or commercial development. The Department also
steps to protect scenic values from encroachment.

# ureau of Indian Affairs

### enn L. Emmons, *Commissioner*

ADDITION to carrying out its trusteeship responsibilities em- icing some 53 million acres of tribal and allotted Indian lands and community service responsibilities involving some 350,000 Indians l Alaska natives, the Bureau of Indian Affairs of the Department the Interior in fiscal 1960 gave increasing emphasis to the economic l social advancement of Indian tribal groups and individual lians.

This was reflected in several ways—in a bigger-than-ever school istruction program which provided over 2,000 additional seats for lian pupils in Federal classrooms during the year and will provide v capacity for nearly 2,300 others as initiated projects are com- ted; in the technical help and guidance given to tribal groups in planning and execution of economic growth programs; and in the adening moves that were made to stimulate the development of -providing industries on or near the reservations.

In a public speech in Washington, D.C., on March 31, 1960, Sec- ary Seaton declared that the "overriding objective" of the Depart- nt in administration of its Indian program is "to provide our Indian izens with adequate opportunities for personal development and owth so they can take whatever place they choose in the larger oric of our national life." During the fiscal year which ended on ne 30, 1960, the Bureau of Indian Affairs directed its resources and rgies more sharply than ever before on a multifaceted program ared toward the ultimate attainment of this objective.

## *Tribal Programs*

Under the heading of tribal programs there were many not le developments in fiscal 1960. On two of the larger reservatio — Klamath of Oregon and Menominee of Wisconsin—further prog ss was made toward a termination of all Bureau of Indian Affairs a ities and responsibilities in line with laws which were enacted in 1 4.

Program development work of the terminal type also assumed siderable importance on the Colville Reservation in Washing among the Catawbas of South Carolina and Choctaws of Oklah and on a substantial number of rancherias in California. Prograr for effective use of tribal funds was especially significant among Standing Rock Sioux of North Dakota and South Dakota and Jicarilla Apaches of New Mexico.

### *Klamath Indians of Oregon*

Under the Klamath Termination act of August 13, 1954 (68. St. 718), as amended in 1958, nearly all of the so-called "fringe un comprised primarily of farm or grazing lands, on the reservatio Oregon were sold during the year, mostly to Klamath Indians.

Of the seven major sustained-yield timber units advertised for within the year, only one was sold. This was the Antelope De unit, comprising 91,540.69 acres with an estimated 68,907,000 b feet of saw timber and 464,399 cords of lodgepole pine. It was to a large lumber company for $1,642,182 or $6,000 over the realiza value. Three of the units put up for sale in the first advertiser were readvertised with bids to be opened December 1, 1960.

Because of the delay in the sales of the properties, extended by amendment of August 23, 1958 (72 Stat. 816), the Klamath act further amended by the act of September 9, 1959 (73 Stat. 4 This amendment changed the acquisition date of the Klamath m by the United States Government from April 1, 1961, to "the ear date after September 30, 1959, when the Secretary of the Inte determines that funds for the payment of the purchase price available from the sale of stamps under the Migratory Bird Hun Stamp Act of March 16, 1934." Taking of title to the marsh payment by the United States was consummated shortly after the of the fiscal year. All terminal action is to be completed by 7 y from the date of the original act, or August 13, 1961.

### *Menominee Indians of Wisconsin*

The act of June 17, 1954 (68 Stat. 250), as amended, required Menominee tribe of Wisconsin to prepare and submit to the Secre he Interior by February 1, 1959, a plan for taking over its property affiairs and managing them in an unrestricted status. Under the the plan may be implemented any time up to, but not later than, ember 31, 1960, when the Secretary must proclaim termination of Federal trusteeship. On January 26, 1959, the Menominee tribe litionally submitted a plan which was described in some detail in Secretary's Annual Report for 1959.

y midsummer of 1959, the tribe's proposals for State legislation undergone extensive examination and adjustment by the Wiscon- State Legislative Council and the State Legislature, and were ed into law by the Governor on July 30, 1959. The Secretary of Interior responded on July 31 that he was approving the tribe's "in principle" but that a period after August 1 would be needed he Department to analyze the plan thoroughly for its conformity ederal and State laws and its equity. The tribe agreed to any nges consistent with the principles of the plan, such changes to be oactive to August 1, 1959. At the close of fiscal 1960, the only l issue yet unresolved was the specific language of a restrictive nant on the forest lands of the new Menominee corporation, which State asked to be examined again and possibly amended to meet the gencies of Wisconsin law.

our new Menominee bills were introduced in Congress in early ). The bills provided that the trust period should be extended ond December 31, 1960, until such time as, in the discretion of the retary, it should be revoked; that a $2,500,000 loan fund be made ilable for the Menominee tribe from Federal sources; that the tribe eimbursed for all of the costs incidental to the termination process; that the tribe be exempted from documentary stamp taxes on stock ances under the Internal Revenue Code.

he Department recommended a short extension of the trust termi- on date, such as 6 months, would be an additional safeguard for successful completion of the termination program; that the tribe elieved from the payment of stamp taxes in connection with its ial organization under the termination plan; and that the Depart- t should be authorized to take the final steps necessary to put the nination plan into operation if the tribe failed to take those steps greed upon before the trust termination date.

ll of these provisions were accepted by the House of Representa- s as it passed a combined bill in June. The House did not adopt Department's recommendation that a loan program, under limited litions, be authorized; and the House refused to approve 100 per- reimbursement of the tribe for the termination expenses as recom- ded by the Secretary. The Senate recessed in July without hear- the Menominee bills.

## *Standing Rock Rehabilitation Program*

Like several other tribes living in the Missouri basin, the Star Rock Sioux of North Dakota and South Dakota have had land t from their reservation in recent years for the building of a n purpose dam and reservoir on the river. The tribe and its men were awarded a total of $12,211,553 by the act of September 2 Stat. 1762). This authorized the United States to acquire land quired for the reservoir to be created by the Oahe Dam and to compensation and rehabilitation funds to the Standing Rock Ind numbering about 6,100.

Of the grand total, $1,952,040 was appropriated to pay the In for lands and improvements actually taken, $3,299,513 for indirect intangible damages, and $6,960,000 for rehabilitation of membe the tribe, regardless of place of residence. Half of the awarc indirect and intangible damages was also to be used for rehabilita making a total of $8,609,756.50 available "for the purpose of dev ing individual and family plans, relocating, reestablishing, and viding other assistance designed to improve the economic and s conditions of all recognized members of the Standing Rock S Tribe."

During the past year, the tribe completed plans for a six-p rehabilitation program and tentatively allocated funds for i follows:

| | |
|---|---|
| Family plan | $3, 64 |
| Community development | 77 |
| Farm livestock | 77 |
| Land management | 76 |
| Industrial development | 77 |
| Education | 1, 77 |

The family-plan phase of the program was approved by the S tary on December 1, 1959. This provides that each enrolled mer will be allocated $650 that can be expended only on the basis family schedule which has been approved by the Tribal Council the Secretary's authorized representative. Of the other phase the program, farm livestock, industrial development, and educa have also been approved. By June 30, 1960, allocations had started on the family plan and farm livestock phases, and $56 had been advanced to the tribe.

## *Jicarilla Apaches' "Family Plan"*

The Jicarilla Apache tribe of New Mexico, which now enjoy annual income of more than $1 million from oil and gas, timber other resources, during the year developed a "family plan" for ribution of some of its accrued funds among its members. This is part of a short-range program designed to meet immediate, cal needs of the Jicarilla Apaches, like better housing, improved enforcement, and wider educational opportunities. Its main ure is the establishment of "approval committees" by the tribe e that the funds distributed under the "family plan" ($1,600 to member) are expended wisely and constructively. The Commis- er approved the plan just after the close of the fiscal year.

nce the beginning of its acquisition of substantial wealth in the 's, the human and physical resources of the Jicarilla Apache have been studied by several nongovernmental groups. Using l and economic data uncovered by these surveys, the Representa- Tribal Council, the tribe's governing body, has adopted several -range programs to protect the tribe's resources and to increase pportunities for its members.

ese long-range programs include provisions for increasing the tock carrying capacity of the reservation's grazing land, pure d stock for improvement of its herds, and sustained yield manage- t of its forests. The programs will benefit the members and their lren in the years to come. In the preparation of both the short- long-range programs, Bureau representatives have worked inti- ly with the Jicarilla leaders and people.

### *ville Indians of Washington*

accord with the act of July 24, 1956 (70 Stat. 626), the Business ncil of the Confederated Tribes of the Colville Reservation, Wash- on, in June 1960, submitted to the House Indian Affairs Subcom- ee a report on the tribes' progress in preparing a plan by August, , for termination of Federal trusteeship of the tribes' affairs within sonable time thereafter.

e Business Council informed Congress that the Bureau had since , 1959, been delivering to the Colvilles a series of reports on the urces and social and economic conditions of the peoples of the vation, and that the Bureau of Land Management was making ress in adjudicating old mineral leases. The Business Council reported that it had appointed a planning committee to direct l activities in line with the obligations imposed by the 1956 act, that it had contracted with a California research organization to e a study of the economic development of the reservation and re organizational possibilities. The research team's leader was ave arrived late in June, 1960, in the hope of completing the ect within 5 months.

conference held on the reservation in early 1960 disclosed that Colvilles differed widely among themselves, with some favoring complete liquidation of tribal assets and their distribution pro others (apparently the majority of those living on the reservat favoring maintaining a group entity of some sort and emphas the economic development of the reservation.

### *Final Disposition of Choctaw Affairs*

The act of August 25, 1959 (73 Stat. 420) supplemented the act to provide final disposition of the affairs of the Choctaw of Oklahoma. The Secretary delegated to the Commissioner aut ity to carry out the provisions of this act.

Preliminary steps leading to the disposition of Choctaw p erty were taken during the year, but a plan for the complete liqu tion of Choctaw affairs has not been worked out. Disposition be completed within 3 years of the date of the act.

### *Catawba Tribe of South Carolina*

The Act of September 21, 1959 (73 Stat. 592) provided for tribution of the tribal assets of the Catawba Indian Tribe of S Carolina among the members and, in effect, provided for termina of the Catawba-Federal relationship.

The application of this law was contingent upon the accept of its terms by a majority of the adult Catawbas. A majority ag to a division of the tribal assets under the act on February 2, 1 and a plan to accomplish this was underway as the fiscal year en The distribution must be accomplished in 2 years from July 2, when notice of this majority agreement was published in the eral Register.

### *California Rancherias*

During the year 12 additional California rancherias submi plans for distribution of their assets. This brought to 37 the num of plans submitted. The act of August 18, 1958 (72 Stat. 619) thorized 41 Indian groups in California to present plans to di Government land among the members of the rancherias.

Six of the plans previously approved and accepted were compl during the year. A plan must be completed within 3 years of final acceptance by the distributees.

### *Wyandotte Tribe of Oklahoma*

The act of August 1, 1956 (70 Stat. 893) provided for termina of Federal trusteeship over affairs of the Wyandotte tribe of O a on or before August 1, 1959. The Bureau of Land Manage- t surveyed the tribe's major resource, a cemetery in downtown sas City, Kans. Thereafter an appraisal of the cemetery prop- established an evaluation of $291,000 after the disinterment of bodies.

tribal referendum revealed that an overwhelming majority of Wyandotte members are in favor of selling the cemetery and ributing the net proceeds after relocation of the graves. Pur- t to this tribal mandate, the Bureau's Area Director adver- d the cemetery for sale in July 1959.

n July 10, 1959, two suits were filed in the District Court of the ted States for the District of Kansas. These actions were entitled *rge Zane, Jr., et al.* v. *United States, et al.*, Civil No. KC–1280; the *City of Kansas City, Kansas*, v. *United States, et al.*, Civil No. -1279. These were actions by the city of Kansas City, Kans., and "Absentee Wyandottes", filed against the Secretary of the Interior the purpose of restraining him from disposing of the cemetery in sas City on the grounds that they had an interest in this property.

his litigation had the effect of depressing the amounts bid on the erty, and the Department of Justice requested that no disposition e property be made pending the outcome of the litigation. Trial held on the controversy in Kansas City in May, 1960; but at the e of the fiscal year the court had not handed down its decision.

the event the United States is successful in defending the interests s beneficiaries, the Secretary will then have the responsibility of ointing a trustee under the 1956 act to liquidate the property and ose of the proceeds to the enrolled members of the Wyandotte e of Oklahoma.

### *ria and Ottawa Tribes of Oklahoma*

1956 Congress provided for ending the special trust relationship he United States with the Peoria and Ottawa tribes of Oklahoma ugh the act of August 2, 1956 (70 Stat. 937) and the act of August 956 (70 Stat. 963), respectively. The function of the Bureau in inistering these two statutes was largely that of determining the l roll of each of these tribes, thereby vesting in these individuals tlement to any future income that might accrue to the tribes.

he Peoria trust termination act differs from any of the others en- d to date by the Congress in that it provides in section 4(b) that hall become "Effective when all claims of the tribe that are now ding before the Indian Claims Commission or the Court of Claims e been finally adjudicated, all powers of the Secretary of the In- r or other officer of the United States to take, review, or approve any action under the constitution and bylaws of the tribe are l terminated."

The Ottawa tribe of Oklahoma, too, has claims still pending the Indian Claims Commission. In view of the fact that the I States may still have a ministerial service to perform for thes tribes in the event the Indian Claims Commission or the Co Claims awards a judgment to them and the Congress then dire Secretary of the Interior to distribute the awards appropriat them, it was decided in fiscal 1960 to defer the proclamations o termination of trust responsibility for these groups until the actions have been completed.

### *Rolls Prepared for Judgment Payments*

The following rolls, prepared for use in the per capita distri of judgment funds awarded certain tribes of Indians, were com and the funds distributed during fiscal 1960:

*Otoe-Missouria tribe of Oklahoma.*—Rolls prepared and fun tributed pursuant to the act of May 9, 1958 (72 Stat. 106). A of $1,155,237.31 was paid to 1,987 enrollees.

*Kiowa, Comanche and Apache tribes of Oklahoma.*—A to $1,916,446.43 was paid to 9,942 persons listed on the roll. The were distributed pursuant to the act of September 21, 1959 (73 598).

*Western Oregon judgment funds.*—The roll was prepared and distributed pursuant to the act of August 30, 1954 (68 Stat. 980 total of $3,092,096.63 was paid to 2,044 enrollees of five tribe bands of western Oregon as follows:

| | |
|---|---|
| Chetco | [1] $417, 990. 0 |
| Coquille | [2] 742, 880. 82 |
| Tillamook | [3] 1, 143, 401. 64 |
| Too-too-to-ney | [4] 381, 454. 26 |
| Umpqua | [5] 406, 369, 90 |

[1] Paid to 674 enrollees.
[2] Paid to 271 enrollees.
[3] Paid to 185 enrollees.
[4] Paid to 504 enrollees.
[5] Paid to 410 enrollees.

## *Navajo-Hopi Rehabilitation*

The Long Range Rehabilitation Program for the Navajo and tribes authorized by the act of April 9, 1950, entered its tent final year in fiscal 1960. Important progress was achieved espe in the expansion of school facilities, the improvement of irri s, the construction of roads and bridges, and the application of and moisture conservation and range improvement practices. x projects involving the construction, expansion or rehabilitation ederal school facilities for Navajo pupils were launched during ear. Included in the total were the Chinle boarding school con- tion, the Wingate boarding school rehabilitation, the Kinlichee ding school expansion, the Low Mountain boarding school class- addition, the Coal Mine Mesa trailer school and the Jeddito er school.

addition to these Federal facilities, a new public school was leted at Chinle with a capacity of 450 students and new tempo- classrooms to accommodate 1,710 pupils were added to public ols at Tuba City, Chinle, Kayenta and Window Rock.

unds available under the Long Range Act for construction of ation facilities were used during the year on four major projects: Extension of the Hogback Canal, including construction of a -foot syphon; (2) farm unit development on approximately 800 , including completion of the necessary drop and turnout struc- on the lands developed in fiscal 1959; (3) replacement of old len structures by new concrete facilities on the Fruitland project; (4) advance planning on the Hogback project.

addition to the $20 million authorized for construction of roads bridges under the original act of 1950, another authorization of nillion for this purpose was provided by the more recent enact- of Public Law 85–740.

ne work put under contract in fiscal 1960 included (1) construc- of a 451-foot bridge across the San Juan River at Farmington, lex.; (2) the paving of 15 miles of road from the Chinle road ward as far as Cottonwood school; (3) the construction of 8 miles oad between Many Farms and Chinle Wash; (4) the first 10 miles oad between Fort Defiance and Navajo to serve the new tribal nill enterprise; (5) two projects totaling 12 miles on the eastern ion of Route 1; (6) two projects on the western portion of Route m Tonalea to Betatakin Ruin turnoff; and (7) replacement of an imber bridge on Route 3 near Window Rock with a new concrete ture.

## *Education*

nrollment of Indian children of school age increased 1.1 percent scal 1960 as compared to the preceding year. Of the 133,316 en- d, 63.5 percent attended public schools, 28.0 percent were in Fed- schools, and 8.5 percent in mission and other private schools. lic school enrollment increased by 3,552 students.

*In fiscal 1960 the Bureau of Indian Affairs operated 277 schools with an enrollm of more than 40,000 Indian children. Housing facilities were provided by the Bu for an additional 3,800 who attended local public schools.*

The Bureau of Indian Affairs in fiscal 1960 operated 277 sch with an enrollment of 40,194 including those under 6 and over years of age. In addition, dormitory facilities were provided at locations for 3,814 students who attended public schools.

## *Quality in Education*

With the goal of a seat for every Indian child almost reach the Bureau's Branch of Education is able to devote more attent to improving the quality of education.

Increased staff for program direction, especially in technical sup vision, has helped to raise the level of instruction in several ar In-service educational programs in each area have provided teach guidance personnel, and administrators with a deeper understa ing of the needs of Indian education and improved ways of meet these needs. For example, each school is working diligently to ra the reading level of each child. Special reading programs have b initiated in several high schools and special reading teachers h been employed to work with cases of retardation.

*the goal of a school seat for every Indian boy and girl almost reached, the u of Indian Affairs is now concentrating on improving the quality of Indian tion.*

ne curriculum, especially in the high school, is being evaluated cally to determine if it is meeting the needs of today's school ılation. Some changes have already been made. There is more hasis on science and mathematics and more students are encour- to postpone advanced vocational education until after high ol graduation.

ne vocational educational program is undergoing some changes. ninal educational programs are gradually being replaced by an strial arts type of program.

## *phasis on Guidance Program*

ore complete staffing of Bureau school housing facilities to assure ours of care for children and youth in boarding schools and come in a 40-hour tour of regular employees has been possible through ls appropriated for this purpose. Emotional security, sick bay rvision, counseling service, creative living experiences and learn- environment have improved for children with the employment ight attendants and additional instructional aids.

*In secondary schools operated by the Bureau of Indian Affairs students are g ample opportunity to develop their skills and interests in arts and crafts.*

Dormitory staffs are better able to give individual attention to s- dents in counseling and group living experiences. Emphasis on development of work space and adequate planning for creative ac i- ties in dormitories is supported by techniques studied by school s with the help of specialists. Some schools report a reduction in d outs.

Summer programs have been planned for students remainin boarding schools between school terms with emphasis on recreati and creative activities. A questionnaire survey on arts and cr activities was made of all Bureau of Indian Affairs schools in w they reported creative activities in classroom and out. The r of activities was wide for the elementary school showing that a crea environment necessary to the discovery and development of art talents exists throughout each Area.

The elementary schools, which enroll 75 percent of the chil have time devoted to arts and art appreciation activities but few cial classes. Two special art teachers have been assigned to work elementary schools in the Southwest. In all schools combined, adult Indians and 619 non-Indian staff members assist with instru in creative activities.

*Physical fitness is stressed in Federal Indian schools.*

## ervation Adult Education

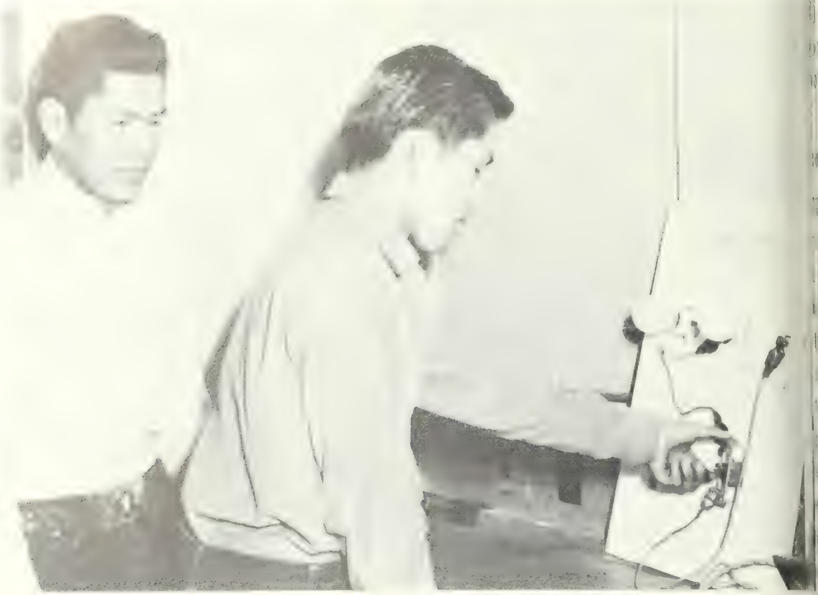
s a result of requests from Indian groups for educational oppor- ities for the adult members of their tribes, the Bureau initiated an eservation adult education program at five locations late in 1955 early in 1956. Since that time, in response to requests from other ian groups, the program has been expanded. At the close of fiscal 1960, there were adult education units under 24 agencies of Area ld Offices serving 97 different reservation communities.

he objective of the adult education program is to raise the general cational level of Indian adults. According to the U.S. Bureau of Census, Indian adults living on reservations in 1950 had attained slightly more than half as many years of schooling as the gen- adult population of the Nation and are, therefore, seriously handi- ped in our competitive society.

uring the past year approximately 3,600 adult Indians have par- pated in formal or informal learning activities under this pro- m. Of these, approximately 1,200 were engaged in formal learn- activities, either group or individual, and 2,400 in informal activi-

## her Education

uring 1960, the Crow Creek tribe of South Dakota, the Fort Peck es of Montana, the Nez Perce tribe of Idaho, and the Standing



*Two Navajo youngsters learn the mysteries of electrical circuits at the Rivers Indian School in Anadarko, Okla.*

Rock Sioux tribe of North and South Dakota have established p grams of scholarship assistance for their youth in education above t high school level.

The Federal grant and loan assistance made possible through t Bureau, the tribal scholarship funds, and the Indian scholarships d nated by school organizations and individuals are being used to f advantage by the Indian students desiring higher education.

## *Welfare*

In fiscal 1960 there was an increase in the need for financial a sistance to indigent families on Indian reservations and addition funds were transferred from other Bureau activities to the welfa program to meet this need.

In addition to providing assistance, Bureau social workers we called upon increasingly to provide counsel, guidance, and social ser ices to families and children with serious social problems where fina cial assistance was not involved. This latter function has become major importance in the welfare program and the need for social ser ices has been recognized officially by a number of tribal officials.

Procedures and guidelines for more effective administration of in vidual Indian money accounts were issued in manual form in Janua

which should result in improved counseling service to Indians
eed assistance in managing their affairs and making constructive
their funds.

## ral Assistance

hile the upward trend in general assistance needs during the past
ears has continued, these needs were met more adequately in fis-
60 than in previous years. Chiefly because of increasing mech-
tion in agriculture, there has been a steady decrease in employ-
opportunities in unskilled seasonal work upon which many In-
depend. Meanwhile opportunities for other employment on or
reservations continued to be inadequate in many areas. A high
ortion of those remaining on the reservations are not employable
se they are children, or too old, or physically not qualified.

sistance expenditures have increased also because of increased
of living. These increased living costs are reflected in increases
e standards of assistance used by States for the State public as-
ce programs, and it is Bureau policy to follow State standards
ch State where the Bureau administers a general assistance pro-
.

e number of Indians receiving general assistance from Federal
s in fiscal 1960 ranged in the usual seasonal pattern from a low of
households, comprising 6,386 persons, in July to a high of 5,599
holds, comprising 18,621 persons, in March. The average
hly grant per household was $71.19 as compared with $68.05
cal 1959.

e average monthly caseload of 11,755 persons in fiscal 1960 was
oximately 18 percent higher than the previous year, and the ex-
itures for such assistance were approximately 20 percent higher.
wo reservations it was necessary to supplement the tribal assist-
program with Federal funds because of exhaustion of tribal
s.

## d Welfare

reased priority has been placed upon dealing with the problems
dian children. The instability of many families on reservations
ins a serious problem and the number of dependent and neg-
d children coming to the attention of Bureau social workers in-
es. As a result of better case finding, the number of physically
entally handicapped children for whom the Bureau is providing
is also increasing. Contracts for foster care services with the
s of Minnesota, South Dakota and Nevada were continued.

The Indian adoption project begun during the previous year pilot project under a contract with the Child Welfare Leagu America is progressing satisfactorily. Under this project Bu social workers on selected reservations can refer homeless childre adoptive placement to qualified adoption agencies selected by Child Welfare League.

Reports indicate that the 15 children who have been place adoption through the Child Welfare League under this painstaki planned program are well placed in their new homes and their a tive families are very happy with them.

A most promising result of the activity of Bureau social worke the field of adoption has been the stimulation of both public and vate agencies in States with Indian populations toward greate tivity in planning for the adoption of Indian children. Another rect result of the project has been to focus more attention on ser which can be offered to young unmarried mothers.

Jurisdictional problems continue in many States to hinder or vent the provisions of adequate protective services for dependent neglected children on reservations. An important case entitled *State of Washington* v. *The Superior Court of the State of Wash ton for the County of Yakima*, involving the jurisdiction of a court over a dependent Indian child on the Yakima Reservation, heard on appeal before the Washington State Supreme Court in

The principal issue involved was whether State courts have j diction on Indian reservations to provide protective services t pendent and neglected children. This is the first such case to con a legal test and the decision will provide an important prece The jurisdictional problem was briefly considered at one of the sions of the 1960 White House Conference on Children and Y and the published recommendation of the conference includes the lowing recommendation: "That a study be made of the legal sys of the United States as they apply to and affect American India

## *Law and Order*

During fiscal 1960 no new legislation was enacted by any State suant to Public Law 280, 83d Congress, to assume civil and crim jurisdiction over Indian reservations.

A suit by an individual Indian challenging the validity of jurisdiction over the Quinaielt Reservation in Washington was i tuted and was pending in the Washington Supreme Court at the of the fiscal year. The challenge was predicated on an allegation the tribal committee which had petitioned the Governor to proc State jurisdiction was not in fact empowered to act for the tribe.

gation is contrary to the position taken by the Bureau in the matter.

Iatters involving Indian juvenile problems came into more prom- nce during the fiscal year. Several juvenile officer positions were blished and programs for prevention of juvenile delinquency are ng started on several reservations. Two cases were pending before Supreme Court of Washington at the end of the fiscal year which olve the question of whether Indian juveniles residing on reserva- is are entitled to the same protective services from State and county ncies as non-Indian juveniles. The Senate Appropriations Com- tee, in its report on the Interior Appropriations Bill for 1961, di- ed the Bureau to make a survey of juvenile delinquency problems he Pacific Northwest to determine the magnitude of the problem the steps that are required to solve it.

he jurisdiction of State courts over criminal acts by Indians within rvations was further narrowed during the year by several deci- is by the Washington State Supreme Court. These cases involved nses committed by Indians within such organized cities as Toppish and Wapato. No trust Indian land was involved but the cities located within the boundaries of Indian reservations. In two of se cases, the State Supreme Court observed, significantly, that, e are aware of the difficulty our conclusions cause in the field of enforcement * * * and of the related problems they raise * * * the solution in this State lies in corrective legislation * * *, not unauthorized assumption of jurisdiction by our State court." It ns apparent that the State Supreme Court believes that the juris- tional questions in Washington can be resolved by appropriate islation pursuant to Public Law 280, 83d Congress.

he Congress enacted during the fiscal year a bill to make it unlaw- to destroy, deface, or remove certain boundary markers on Indian rvations, and to trespass on Indian reservations to hunt, trap or . The bill was approved after the close of the fiscal year. It is igned to protect the wildlife resources of Indian tribes. It was med necessary after experience demonstrated that use of State s against non-Indians was not practical. Indian tribes generally oughout the country joined in supporting the measure and urging Congress to enact it.

## *Employment Assistance*

umerous steps were taken in fiscal 1960 to improve the quality of vices to Indians in the field of employment assistance. The total mber of Indian men, women and children benefiting directly from h services was 8,281 as compared with 7,200 in fiscal 1959.

## *Relocation Services*

Relocation of Indian people for employment continued ove he fiscal year as a whole on about the same level as in the previous ar Assistance was provided to 3,674 persons including 1,798 who located as single individuals or as the heads of family units.

The relocation services office at St. Louis, Mo., was closed d ng the year primarily because the city had proved to be a comparat ely unpopular destination for Indians relocating from the reserva ions. This left eight city offices still in operation at the close of the pe od. Four of these were in California—at Los Angeles, San Fran co, Oakland and San Jose. The others were at Chicago, Cleve nd, Denver, and Dallas.

Progress was made with relocatees in improving housing acco odations, training them for more effective money management he upgrading of jobs, encouraging night school training for adults nd stimulating interest and participation in community activities

## *Adult Vocational Training*

Because of the increased interest of Indians in adult vocat cal training and the limited funds available to provide services, ne Bureau in fiscal 1960 initiated a new program of relocation for nployment prior to training. Through this operation, Indians wo applied for vocational training and could not be accommod d immediately were given an opportunity to move to the city sel ed for training and be profitably occupied during the waiting pe d. About 200 Indians took advantage of these opportunities.

By the close of the year, the Bureau had approved 438 vocati al training courses at 156 institutions for enrollment of Indians u er the program. This was an increase of about 10 percent in the nu er of approved courses as compared with the previous year. The st popular courses were automobile, aircraft and diesel mechanics, n al work trades; and various types of commercial training.

Training was provided during the year to 1,771 Indian enro les and services were made available under the program to 3,896 per ns including family dependents. The number of new enrollments as limited because of the number carried over in training from the evious fiscal year.

Valuable help was given to the Bureau's field staffs by nearby iversities and State employment services in determining the aptit es of Indian applicants and in providing vocational guidance for rginal cases.

### the-Job Training

pportunities for on-the-job training in plants located on or near reservations were made available to Indians through contracts ı industrial companies. Training of this kind was given to 260 ians during the period and guidance was furnished under the gram to 260 family dependents of the trainees. At the end of fiscal year, 10 contracts for on-the-job training were in effect others were in process of negotiation.

## *Industrial Development*

he purpose of the Industrial Development Program of the Bureau ) assist the Indian people in cooperating with their neighboring munities in the development of plans and programs which will act industry to the areas surrounding the reservations and thus vide employment opportunities and improve economic and social litions.

uring fiscal year 1960, continued emphasis was placed on (1) work- with tribal leaders to explain the basic concepts of industrial de- pment and the need for cooperation with communities near the rvations to create the proper industrial climate; (2) assisting al and community groups in organizing industrial development ndations and similar entities in order that they will be in a better ition to negotiate with industrialists interested in reservation locations; (3) gathering necessary basic information on resources ilable and assisting in the preparation of fact sheets and brochures ch clearly outline facilities available in the reservation areas; (4) providing information and assistance to industries which e indicated interest in expansion or relocation of their present duction facilities. This latter type of assistance was provided to industrial concerns in fiscal 1960.

he growing interest of Indian tribes in industrial development is wn by the fact that the following tribal groups have taken action armark their own tribal funds indicated for industrial develop- t purposes:

| | |
|---|---|
| ern Band of Cherokee Indians, North Carolina | $150,000 |
| ding Rock Sioux tribe, North Dakota | 770,000 |
| e affiliated tribes of Fort Berthold Reservation, North Dakota | 50,000 |
| ajo Tribe, Arizona | 200,000 |
| du Flambeau Band of Chippewa Indians, Wisconsin | 40,000 |
| Courte Oreilles Band of Lake Superior Chippewa Indians, isconsin | 40,000 |
| calero Apache tribe, New Mexico | 51,000 |
| ee-Sioux tribe, Nebraska | 10,000 |

*This is the first plant ever built with Indian tribal funds specifically for leasi by a private industrial company. It is on the Cherokee Reservation in western th Carolina and provides year-round jobs for about 130 tribal members.*

Nearly 600 meetings were held during the year with tribal gr ps and with civic organizations of communities near reservations o bring about a better understanding of industrial development g ls and problems. As a result of the work done with the various t ies and communities, 58 industrial fact sheets and 9 brochures were re-pared to cover communities on or near reservations.

The development of overall plans for proper utilization of In n lands which have a high degree of industrial possibilities is esse al for use in the selection of industrial sites. With this in mind he Bureau contracted during the year for economic and enginee g studies covering a portion of the Salt River and Gila River Rese a-tions in Arizona and the Sandia Pueblo Reservation in New Me o.

Complete inventories of reservation area resources are also e n-tial to the promotion of industrial development. A beginning as made in this direction when arrangements were made for a stud of clay deposits on the Pine Ridge Reservation in South Dakota. he technical work is to be done by the Department's Geological Su y and Bureau of Mines on a reimbursable basis. The Bureau of M es also started a mineral resources economic study on two reservat ns in the Missouri River Basin. The inventory of resources on he Makah Reservation in Washington is scheduled for completion b he end of 1960 and plans for a forest products plant are progres g satisfactorily.

Individual State maps, showing locations of Indian reservat ns and related data, have been printed and a United States map fo se in promotion and attraction of potential developments is in pr ss of preparation.

n addition to these steps aimed at attracting industry, many op-
tunities have been developed for the employment of Indians in
nts now operating in the vicinity of reservations.

ne industrial company, engaged in the manufacture of quilted
other soft goods, opened a new plant with 77,000 square feet of
r space on the Cherokee Reservation, North Carolina, in October
9, and dedicated the new building 2 months later. The plant was
structed by the Eastern Band of Cherokee Indians at a cost of
0,000 and leased to the company for 25 years. At the close of
fiscal year, 130 Cherokee Indians—80 percent of them men and
percent women—were employed in the operation.

he approval of a 25-year lease on a 32-acre tract of tribal land con-
ded the final arrangements by a forest products company for the
tion of a $300,000 wood treatment plant on the Yavapai Reser-
ion at Prescott, Ariz. Wood products to be treated include rail-
d ties, fence posts, mine timbers, poles and cross-arms for utilities,
es for barns, and guard rails and mudsills for residential construc-
n. A total of 28 men will comprise the work force of this plant,
luding the cutting and hauling of timber, and preference for em-
yment will be given to qualified Indians.

## *Realty*

he desire of a number of Indian tribes to acquire land being of-
ed for sale by their members continued as a major concern of the
reau. A moratorium on the sale of land by individual Indians,
ept to the tribe, was continued in effect on the Standing Rock
ervation in North Dakota, where the tribe is relocating and re-
ilitating Indian families whose homes and farms lay in the area
en for the Oahe dam and reservoir project on the Missouri River.

t the Omaha Reservation in Nebraska, a land sale moratorium was
ended pending the receipt by the tribe of a sizable judgment
ough the Indian Claims Commission and development of a tribal
gram for the use of a portion of the fund for purchase of land.
es of land were temporarily suspended at Fort Belknap and North-
Cheyenne in Montana, at the request of the tribal councils, to
ble them to work out details of lands purchase programs.

he act of September 21, 1959 (73 Stat. 602) provided the neces-
y authority for effecting the highest possible measure of equaliza-
n of values to the Indian allottees of the Agua Caliente (Palm
rings) Band of Mission Indians in California by removing the
viously existing acreage limitation on allotments there and en-
ing the Bureau to proceed with the allotment of all of the remain-

ing tribal land holdings, except for a relatively small acreage in scenic canyon areas and several other small tribal reserves.

### Acquisition and Disposal

During the year 12,782 transactions involving land acquisitions disposals, including 1,892 probate inventories, were processed by Bureau. All told, 701,805.51 acres of trust or restricted land disposed of by individual Indians and tribes, while during the period, 329,676.04 acres were acquired through purchases and changes by individual Indians and tribes.

Lands removed from Federal jurisdiction on the Uintah and O (Utah) and Klamath (Oregon) Reservations and certain Califo rancherias in connection with their termination programs tota 326,053.72 acres.

Sales to unrestricted status at the request of Indian owners counted for 1,378 approved transactions; issuance of fee patent Indian owners, removals of restrictions and certificates of compete for 759; exchanges and partitions for 410; purchases for 907; other miscellaneous transactions for 1,215. The Bureau also p essed an additional 6,221 realty applications which resulted in transfer of property rights for the reason that the applications either disapproved or withdrawn.

### Minerals

Royalty on production was the principal factor in increasing total income from oil and gas development on Indian lands f $46,468,099 last year to $47,696,957 for the current year, notw standing the drop in rental income for the same period from $5,854 to $4,801,446. The decrease in rents was due to the general oversu of crude oil which brought about the termination of some lease Indian lands and reduced the interest in the drilling of explora wells and the acquiring of new leases.

Sales of special interest brought bonuses in excess of $10 mil for the Ute Reservation leases in New Mexico and Colorado an excess of $1 million for leases on the Blackfeet Reservation, Mont Leases were also sold on Navajo lands in Utah for a royalty rate with a fixed bonus of $500 per acre. The royalty rate bids avera 48.31 percent. Aside from these few sales of special interest, eva tion of oil and gas leases on which there has been no developmen date was the outstanding feature during the current year.

By far the main source of Indian mineral income apart from and gas was the royalty from uranium production on Laguna Pu s in New Mexico. Due to restrictions on the purchase of uranium e was a drop in the overall income from this source. No new ium leases were offered and a considerable number of leases were endered. The Fort Hall, Idaho, phosphate leases are producing 1 million tons per year and the outlook is promising. Because oor market conditions and the low grade of the ore, it was necessary to make a royalty reduction in the Quapaw lead and zinc mining s. Due to the market conditions, operations on these leases have shut down throughout the year.

he total royalty from all minerals other than oil and gas produced ndian lands amounted to $2,661,000 which is a drop of $603,380 the previous year.

### *ure and Management*

fiscal 1960 the Bureau of Indian Affairs closed 2,502 cases granting rights-of-way over Indian lands for various purposes. At the of the year there were 32,136 surface leases or permits of all s in force on Indian lands, covering 3,478,249 acres and providing nnual rental of $10,397,944 for the Indian owners. These leases permits cover the use of Indian lands for farm, farm-pasture, ing, and business purposes. They do not include lands embraced nge units.

survey of the long-term leases made under authority of the act ugust 9, 1955 (69 Stat. 539), was conducted during January . It was found that 821 long-term leases had been approved at time of the survey and that 593 proposed long-term leases were pending. Of the approved leases, 167 are for agricultural purs; 565 are for business, including residential and recreational oses, and 89 are for other purposes. The latter category includes cipally leases made at nominal rentals for religious, educational her public purposes.

hile the annual rental income from these long-term leases shows t increase of only $657,729, many of the business leases are on erly undeveloped property, and their rental consideration is still he minimum guaranteed rental basis or, in many cases, on the of a low rental during the construction period. The estimated of the improvements to be made to the land or structures that remain on the land and become the property of the Indian lessor e termination of the leases under the conditions of the approved racts is over $19,100,000.

spite of this excellent showing, it has been found that the maxi- lease term of 50 years, obtainable under the 1955 act, is not enough to enable developers of large scale enterprises to obtain institutional financing. During this fiscal year, statutes have l enacted authorizing leases for terms up to 99 years for the A Caliente (Palm Springs) Reservation, Calif., and for the Na Reservation. The Department has recommended that this lo authority be made generally applicable to all Indian lands.

### *Records*

During fiscal 1960 an actual test of the previously proposed sys for the modernization of the Bureau's land records was condu covering the Lower Brule Reservation in South Dakota. Based u the excellent results obtained therefrom, an approved land rec improvement program, phased over a 5-year period, was develo It provides for a land index, patterned on the Torrens metho recording land title transactions, the preparation of ownership st maps and a modernized title system.

In the construction of new indices, the greatest possible use be made of modern electronic data processing equipment in sor and chronologically listing the great mass of title data affecting In lands.

## *Forestry*

Timberlands are the principal asset of many Indian tribes and i vidual Indians. In fiscal 1960 good additional progress was achi in developing these lands for the benefit of the Indian owners. volume and value of timber sales were at an all-time high. J created by the timber harvest were at an equally high level. Deci action was taken to expand two tribal sawmill enterprises, and program of timber inventories was continued as a first step in revision of timber sale schedules.

In addition there was continued evidence of the Indians' grov interest in forest management.

To provide a sound foundation for future development, a pr was begun during the year to review policies governing the use of tr and allotted timberlands. On this foundation there will be prepa by reservations, long-range plans for timberland management, in Indian interest, and for the benefit of dependent communities. need for this project has increased in recent years.

### *Timber Sales*

The volume of timber cut under contract and used by tribal sawn reached the record figure of 595 million board feet in the fiscal 1960. Cash receipts were also at a record high of $12.25 mill income to the Indians, after the required deductions for adminative expense, was about $11 million.[1]

*Timber cut under contract and used by tribal sawmills (exclusive of Klamath Reservation)*

| | Volume cut, million feet, board measure | Cash receipts |
|---|---|---|
| Calendar years [1] 1951 | 488, 364 | $5, 159, 502 |
| Calendar years 1952 | 486, 299 | 6, 356, 863 |
| Calendar years 1953 | 504, 614 | 7, 262, 902 |
| Calendar years 1954 | 476, 075 | 7, 254, 012 |
| Calendar years 1955 | 581, 015 | 8, 659, 332 |
| Calendar years 1956 | 507, 548 | 9, 759, 034 |
| Calendar years 1957 | 433, 347 | 8, 501, 266 |
| Fiscal years 1958 | 426, 081 | 8, 275, 876 |
| Fiscal years 1959 | 534, 695 | 10, 082, 747 |
| Fiscal years 1960 | 595, 354 | 12, 273, 682 |

[1] Data by fiscal years not available prior to fiscal year ending June 30, 1958.

'imber sales benefit the Indian owners in at least three ways. y provide a direct cash income from the sales; they create employ-it opportunities; and, as a rule, they foster stabilized communi-on or near the reservations.

n the average, the process of cutting 1,000 board feet of standing ber and converting it into lumber, requires two man-days of labor. this rule of thumb, the 595 million board feet of timber cut on ian lands in fiscal year 1960 created more than 1 million man-days mployment. With minor exceptions, all of this employment was the reservations or at adjoining mills. All of it was in kinds of k for which the Indians have shown real aptitude. The contracts sale of Indian timber provide for preferential consideration of ians when they seek employment and are competent.

'he job-creating aspect of forest management should be recog-d. The 10-year record of sales, above, shows that the volume of s in 1960 was about 20 million board feet greater than in 1959, cash receipts were $2.25 million greater. Equally important, but shown in the tabulation, is the increase of about 40,000 man-days mployment resulting from the increased sales.

### vajo and Fort Apache Tribal Sawmills

)uring fiscal 1960 plans crystallized to expand the Navajo and Fort ache sawmill enterprises. The former is located in Arizona and v Mexico; the latter in Arizona:

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ll general statements and supporting data are exclusive of the Klamath Reservation regon. Data for that reservation not included because of progress in terminating Federal trust responsibility, pursuant to the Act of August 13, 1954, as amended.

*Ground-breaking ceremonies for the new tribal sawmill on the Navajo Reser in New Mexico. Recent inventories of the Navajo timber resources showe the annual cut could be substantially increased under a sustained yield manag program.*

The Navajo Tribe had previously authorized the use of its for a forest inventory, which was needed in order to recalculat allowable annual cut. It was found that the annual cut shou increased from an average of 15 million feet to more than 50 m feet. The tribe thereupon retained engineering consultants to a on design and construction of a new sawmill capable of han the increased production. A management board was appoint direct the expanding enterprise, composed of four members o tribe and five men of demonstrated ability in the business w particularly in the wood-using industries. On May 19, 1960, gr breaking ceremonies were held to mark the start of construction new mill. A modern town to house and service the mill employee also be constructed.

This expanded Navajo Sawmill enterprise will begin operatic 1961. It will add substantially to the job opportunities availab members of the tribe. On-the-job training will be available t pare tribal members for the higher skilled positions.

ıe White Mountain Apache Tribe of the Fort Apache Reservation financed a forest inventory. It also retained an engineering connt when it was found that annual production of the tribal enter- should be increased, from about 10 million to 20 million board A new mill will be erected at a place readily accessible to many l members in need of employment. It is expected that the new will be in operation in 1961.

### an Interest in Forest Management

ıe expanding sawmill enterprises are evidence of awakening int among some Indians in the management of their forests. Such est is also reflected in tribal financing of forest management rams.

r many years, various tribes have authorized limited use of tribal s in forest-fire suppression. But in fiscal year 1946 only four s contributed to the cost of other forest management activities. iscal year 1959, the number of these participating tribes had ined to 18. All important phases of forest management are now ssed with tribal representatives. The consultations increase in rtance as the tribes gain experience in these matters. Individual ın interest is also being stimulated through the media of personal cts and newsletters.

## Irrigation

ıe Indian people own approximately 53 million acres of land. includes range and forest land, dry farm land and irrigated land. ıeir irrigated land, they operated 391,000 acres themselves in fiscal This amount, which is 0.7 percent of the total Indian-owned produced $10 million or 20 percent of the $50 million income zed during the year from all agricultural uses, including agriral leasing.

total of 647,000 acres was irrigated under Indian irrigation projın 1959. This includes the acreage farmed by Indians, Indian leased by others and land owned by non-Indians within the Inprojects. Gross production from these lands totaled over $60,00, an increase of more than 13 percent over the previous 5-year ıge.

view of the relatively high production capacity of the irrigated s, the Bureau is concentrating a particularly strict management t on the Indian irrigation projects to improve and maintain this ıre of the Indian economy. Continuing programs for betterment of Indian irrigated land and expansion of irrigation facilities being carried on.

Major accomplishments were as follows:

| | New | Replaced or rehabilitated |
|---|---|---|
| Irrigation: | | |
| Acreage brought under works | 2, 320 | 1, 210 |
| Structures (number) | 1, 124 | 1, 622 |
| Wells and Pumping Plants (number) | 14 | 6 |
| Lining canals and laterals (miles) | 9 | 34 |
| Drain ditch (miles) | 19 | 22 |
| Tile drains (miles) | 23 | |
| Acreage drained | 3, 076 | |
| Power: | | |
| Customers | 194 | |
| Transmission Lines (miles) | 11. 6 | 23 |
| Distribution Lines (miles) | 31 | 14. 6 |
| Transformers (number) | 201 | 161 |

## *Operations Now Under Way*

Major construction programs now under way include the 21, acre Michaud Irrigation Division on the Fort Hall Reservat Idaho; the 15,000-acre Hogback Unit, Navajo Reservation, N. M and the 10,000-acre project for the Coachella Valley Indian land California.

The more important rehabilitation activities are concentrate over 20,000 acres of Middle Rio Grande Pueblo lands, the 100, acre San Carlos project, Ariz.; the 40,000-acre Blackfeet pro Mont.; the 12,000-acre Duck Valley project, Nev.; and the 10, acre Pine River project, Colo. In addition, preliminary stu and planning as well as survey and design work are continuing on proposed Navajo project, N. Mex., and the Animas LaPlata Dolores projects, Colo., totaling approximately 133,000 acres.

Public Law 85–671 enacted in 1958 provided authority and terms and conditions under which Federal responsibility for ad istering the affairs of 41 Indian rancherias in California migh concluded. Among the conditions outlined in the law was the struction, completion or rehabilitation of certain water supply fa ties. Such work remains to be done on only 13 of the 41 ranche The drainage situation on the Colorado River irrigation project been greatly improved. Of the acreage under project works, appr mately 95 percent is now considered as having adequate drainage

## *Agricultural Extension*

Development of better agricultural extension procedures w major objective of the Bureau during fiscal 1960. In this activity

*oup of Navajo and Pueblo sheep-owners participating in the New Mexico*
*Fair Range Sheep Show.*

of land grant college extension organizations was enlisted to
t Bureau technicians, as well as Indian groups, in program sub-
matter, personnel training, and specialist assistance.

ojects have been designed to enhance leadership development,
nunity improvement, farm and home management, conservation
sources, housing, youth training, and health. The Arizona and
Mexico Extension Services have included more than 300 Indian
and women in their regularly held activities such as "wool grading
narketing school" and "homemakers college."

vents during past years revealed a growing awareness of the
rtance of the communications process between Bureau land op-
ons technicians and the Indian people in promoting programs
lving resources utilization. As a result of this realization and
e interest of presenting information to Indians in a more under-
lable and usable form, the Gallup area branch of land operations
icipated in the national project of agricultural information com-
ications, which is sponsored by the American Association of
l Grant Colleges and the Kellogg Foundation. The project con-
l of a series of workshops devoted to basic and oral, written,
audiovisual phases of personal communications.

ver the year as a whole, 10,132 meetings were held in Indian areas
ureau technicians and land-grant college specialists with 243,552
ans in attendance. The stress on improved methods of giving
nstrations and on the farm instructions has resulted in a note-
hy increase in Indian family interest, participation, and adapta-
of improved farm and home practices.

*A group of Pueblo Indian women departing for the New Mexico State Ext ion "Homemakers College."*

## *Rural Development*

The Bureau's extension program, which includes contractual rvices provided to Indians by the land grant colleges has recentl nvolved cooperation in 15 States, with other Federal agencies in a b id program of rural development.

Indians residing on reservations in five of the western States, w re "pilot" counties are established, have been encouraged to partic te in the National Rural Development Program which is coordin ed by the U.S. Department of Agriculture. One proposal of the prog am is to coordinate the services of Federal, State, and county as ll as private business interests in low-income rural areas for dev lopment of broader opportunities to individuals in agriculture an ndustry, as well as for the acquisition of vocational skills.

Montana, for example, is one of the western States particip ting in this nationwide program, and it has designated Lake County a "pilot" program county. Lake County includes considerable nd owned by the Flathead Indians and has a heavy Indian popula n. A representative of the Flathead Reservation tribes is on the ke County rural development planning committee.

## *4–H Program*

The number of Indian young people in 4–H Clubs continu s o increase. In fiscal 1960, there were approximately 10,000 Indian ys and girls throughout the country participating in 4–H Club ac i-

*Hopi Indian 4–H Club members giving their livestock conservation team onstration which won them first place in Arizona and second place at Chicago ational competition.*

on the same basis as non-Indian boys and girls. Many of these
Club members have received county and statewide recognition for
r achievements in project completions and in giving demonstra-
s in subjects relating to agriculture and home economics.

## *Soil and Moisture Conservation*

he soil and moisture conservation program on Indian land con-
ies to become more popular with the Indian people from year to
as their understanding of its benefits increases. Primarily for
reason, more emphasis has been placed on the educational phase
he program and in fiscal 1960 there were 3,292 conservation meet-
s held with Indians as compared with 2,180 in 1955. Accomplish-
its in the program shift from time to time as the need and
erstanding demand. The accompanying chart compares 1955 and
accomplishments to show this shift by the percentage of change in
e of the major conservation practices.

1 1960 the Bureau spent $4,859,098 of appropriated money for
and moisture work on Indian land. At the same time the co-
rators or land users spent $21,709,166 on the same phase of the
gram. Added emphasis is being put on soil surveys. In 1955
iled soil surveys were made on 940,433 acres. In 1960 the same
of survey was made on 3,329,269 acres. Soil surveys furnish
c technical information that is essential to assure Indian people
he highest quality soil conservation program that will help them

*These Pima Indian girls exhibited their sewing projects at the Pinal County,*
*4–H Fair winning blue and red ribbons.*

to obtain the maximum crop production and income from agricult
use of their lands.

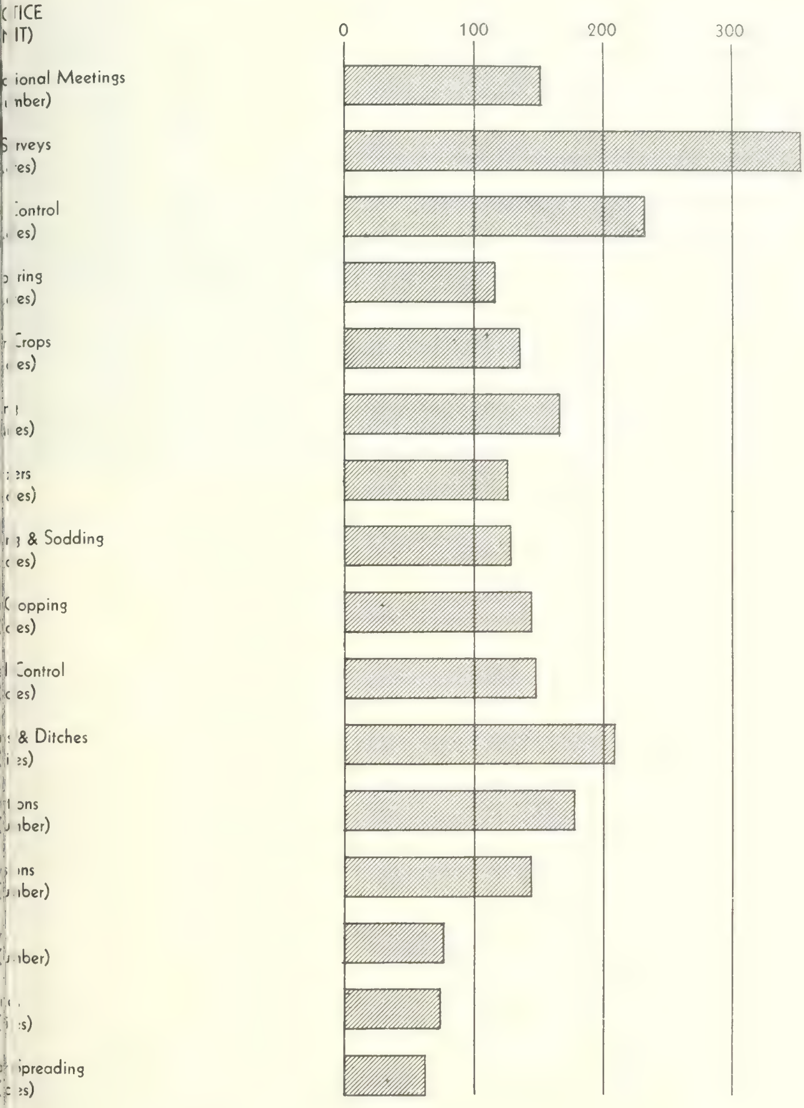
Another phase of the program that has received added atte
during the past year is brush control. In 1960 brush control
was accomplished on 144,330 acres as compared to 65,065 acre
1955. In some places where brush has been removed and the
has been seeded to adapted grasses, the grazing capacity has
increased up to 15 times. The best results on this type of work
been obtained in the higher rainfall areas. In some areas of l
rainfall approximately 8 to 10 years are required to return
investment in increased grazing capacities. In other projects
Bureau has found that the entire cost of the practice can be retu
in less than 2 years.

## *Range, Wildlife and Recreational Resources*

The year 1959 provided a major test of the range manage
program in effect on Indian reservations in North Dakota and S
Dakota where drought conditions were especially severe. Fifty-
counties of these two States were designated as drought disaster a
for the purpose of emergency loans for livestock feed purchase. H
ever, as a result of the Bureau's program of range management
livestock operators on Indian reservation lands in these two St
came through almost unscathed apart from a few cases of red

# SOIL AND MOISTURE ACCOMPLISHMENTS IN 1960 COMPARED TO 1955

(1955=100%)



*In 1954 this 14,000-acre tract on the Hualapai Indian Reservation in Arizona virtually wasteland, capable of supporting only 66 head of cattle.*

*Five years later, after controlled burning and seeding, the same land had a gra capacity of 990 head. Conservation practices not only controlled erosion increased the annual value of forage production by $2.13 per acre.*

*my Indian tribes are now developing the recreation resources of their reserva- ns as a new source of revenue. This is Hawley Lake on the Fort Apache Reser- ion in eastern Arizona developed and operated by the White Mountain Apache be.*

estock water supply. Supplemental feed was not required. In ost instances prairie hay was available for harvesting.

More than 81 percent of the Indian range is used by Indian live- ck operators. The grazing privileges temporarily in excess of the ed of Indian livestock were sold through competitive bidding and en brought the highest price within a particular state.

Use of the Indian range resource for 1959 calendar year is as lows:

| | Acres (thousands) | Percent of acreage used | Animal units grazed (thousands) | Use value (thousands) |
|---|---|---|---|---|
| Total range | 41, 115 | | | |
| Total use | 40, 563 | 100 | 816 | $5, 783 |
| Non-Indian use | 6, 889 | 18 | 348 | 2, 028 |
| Indian use | 33, 674 | 81 | 468 | 3, 755 |
| Not used | 552 | 1 | | |

n addition to the range resource, practically all Indian groups e their wildlife and recreation resources. Several Indian groups e developed these resources with the help of Indian Bureau tech- ians and with assistance provided by other bureaus of the Depart- nt. In recognition of the trend toward greater use of the Indian

*Monument Valley on the Navajo Indian Reservation in Arizona.* ***Indian Bu*** *asphalt road between Kayenta and the beginning of Utah asphalt road Nc at the Arizona-Utah State line.*

recreation resource, the Bureau in 1959 revised its procedures gathering statistical data bearing on these potentialities. The formation will be available for analysis early in 1961 to further as the tribes in their recreation programs.

## *Roads*

The Bureau's 1960 road construction and road maintenance p grams totaled $17.4 million and were active on 71 Indian reservati in 20 States.

The $2.8 million road maintenance program provided for upk on 16,807 miles of reservation roads and bridges. The work inclu surface repairs, blading, repairs to drainage, clearing of right of w and snow removal.

The $14.6 million road construction program consisted of 120 p ects ranging in value from $5,000 to $680,000. Some of the sma projects were completed with reservation maintenance equipment government forces. Most of the projects were advertised for cont and some contracts covered two or more projects. Interest and c petition among the contractors were very good; the average num of bidders per contract was 7: the number and value of contr awarded during the year are as follows:

Fifty-three contracts valued at $5,000 to $100,000
Twenty-nine contracts valued at $101,000 to $500,000
Six contracts valued at over $500,000

*r Corners Oil Field. Bridge built by Bureau of Indian Affairs across San Juan er helps in development of resources on Navajo Indian Reservation.*

Included in the construction program was $5 million for Routes nd 3 on the Navajo and Hopi Indian Reservations. These two ss-reservation roads are being constructed to State highway secdary standards in accordance with Public Law 85–740; upon comtion of agreed construction, the States of Arizona and New Mexico ll designate each route as a State highway. Contracts have been arded for 8 of the 19 projects on Route 1 and 7 of the 13 projects Route 3.

The construction work accomplished during the year over the ntry as a whole included 394 miles of grading and draining; 253 les of gravel surfacing; 209 miles of asphalt surfacing; 4,540 feet bridges; and 586 miles of surveys and plans for future projects.

The Bureau's nationwide road system was reduced by 1,030 miles der the policy of building roads to an acceptable standard and nsferring them to a local governmental unit for maintenance where ssible.

Bureau road construction and maintenance activity was terminated the Klamath Indian Reservation with the transfer of all roads and ponsibility to Klamath County under the terms of a 1955 agreent. This agreement and the acceleration of the road program were rt of the Bureau's termination program at Klamath under Public w 587, 83d Congress.

The road program on the Menominee Indian Reservation was also celerated under the termination program provided for in Public w 399, 83d Congress. On August 11, 1959, the Bureau entered into

*Actor Vincent Price, a member of the Indian Arts and Crafts Board, inspects work of a Navajo rug weaver at the annual Inter-Tribal Indian Ceremonial Gallup, N. Mex.*

an agreement with the State of Wisconsin in which the State agre to accept the transfer of all Federal public roads on the Menomi Reservation and to designate them as State, county, or township roa if the Bureau provided the rights-of-way and constructed certa roads. The estimated cost of construction was $700,000. Funds we made available and the necessary work started and progressed schedule for completion prior to termination of Bureau activities.

## *Arts and Crafts*

The Indian Arts and Crafts Board continued to provide technic advice and assistance in production and marketing to Indian cra groups and to individual Indian artists and craftsmen.

During the past year a significant change was made in the oper tion of the Seminole crafts program in Florida. The Semino Crafts Guild, organized in 1940 on the Brighton Reservation wi membership restricted to crafts workers of that reservation, has be purchased by the Seminole tribe and become a part of the tribal ente prise system. An Indian village and arts and crafts center was bu at Dania, Fla., and opened for business early in March. Upon t request of the tribe, the Indian Arts and Crafts Board through s and crafts specialist continues to give advice and assistance in operation of the crafts program just as was done with the Seminole fts Guild.

arly in the spring of 1960 work was begun on a new $50,000 high- y sales center building for Qualla Arts and Crafts Mutual at rokee, N.C. The building was scheduled for completion in July, l before the end of the tourist season. This craft organization has some time looked forward to having its own building where all activities could be housed. Previously, the craft shop was in one lding while the business offices were in another some distance away. ving both activities in one building will make for more efficient ration and, because of the strategic and desirable location of the building, prospects are bright for an increase in business.

n other areas where there are active arts and crafts projects— th Dakota, Oklahoma, and Alaska—there has been progress, par- larly in the strengthening of the craft organizations. There was a slight increase in sales over the past year.

## *Plant Design and Construction*

rimary consideration in the Bureau's construction program for al 1960 was given to school facilities in order to provide classroom s for those children not able to attend school because facilities not exist. Additional work also involved alleviating the over- vding at certain schools and the correction of some safety and itary hazards.

he Bureau architectural and engineering staff designed 46 in- dual projects and supervised the construction of 45 projects in- ving schools, dormitories, quarters, municipal centers, utilities, and er similar facilities.

rojects involving the construction of schools and related facilities viding for approximately 4,400 Indian pupils were under way dur- the year. Twenty-six of these projects were completed providing ce for more than 2,000 pupils.

he Bureau assisted the United States Public Health Service in Indian Health Program by completing 7 construction projects, uding 3 hospitals and by supervising the continuing construction 1 projects, which include 8 hospital facilities.

## *Credit Activities*

he activities of Indians have been financed more adequately the t few years than probably at any time in their history. The fol- ing table shows the progress made:

| Report at June 30 | Financing by customary institutions [1] | Financing through bureau | Total |
|---|---|---|---|
| 1954 | $27, 665, 135 | $21, 449, 804 | $49, 114, 939 |
| 1955 | 33, 959, 558 | 27, 149, 696 | 61, 109, 254 |
| 1956 | 55, 725, 811 | 29, 961, 299 | 85, 687, 110 |
| 1957 | 59, 424, 956 | 30, 344, 983 | 89, 769, 939 |
| 1958 | 60, 998, 783 | [2] 31, 441, 536 | [2] 92, 440, 319 |
| 1959 | 67, 670, 018 | 32, 690, 234 | 100, 360, 252 |

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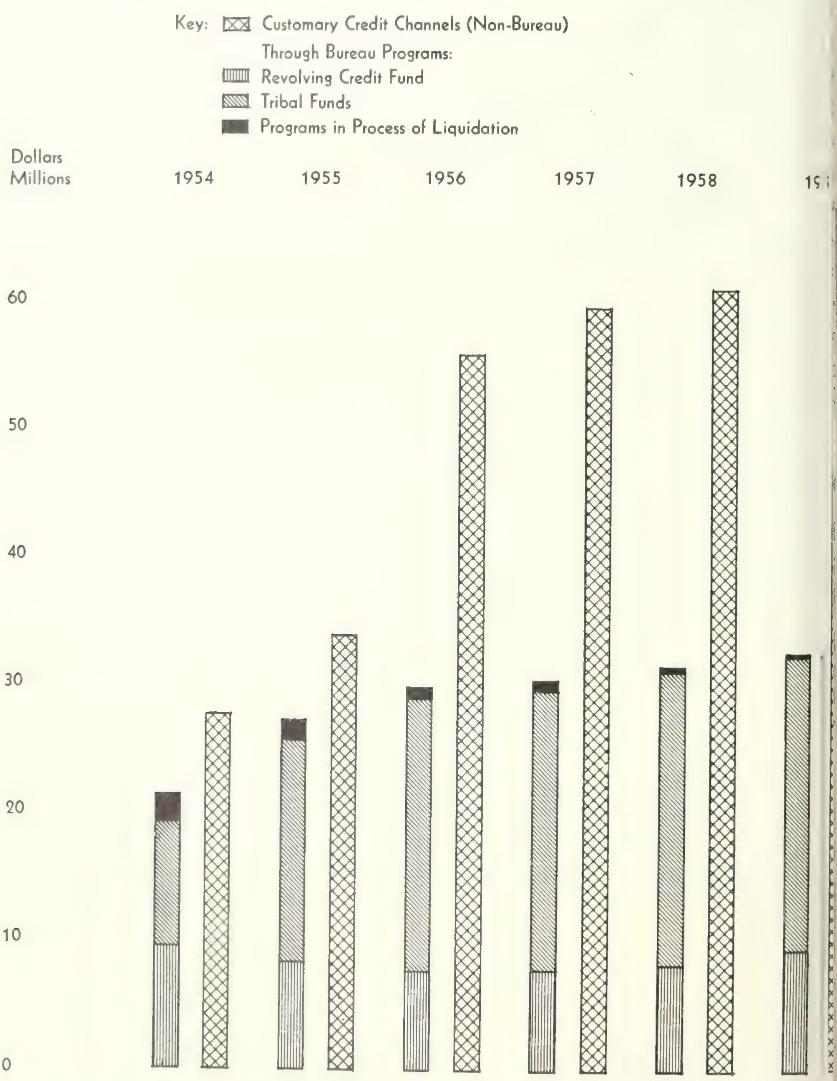
[1] Figures are as of December 31 of preceding calendar year.
[2] Adjusted figures.

COMPARATIVE SUMMARY OF FINANCING RECEIVED BY INDIAN
AND THEIR ORGANIZATIONS



## ancing by Customary Financial Institutions

uring 1959, the Bureau continued to place primary emphasis upon oing Indians and Indian organizations obtain needed financing n the same institutions that serve other citizens. Many Indians deal with lenders on the same basis as other people. Conse- ntly, complete information is not available on the amount of ncing they receive. The estimated financing received by Indians n customary lenders during the current report year increased by e than $6 million, or 11 percent over the amount received the eding year.

he act of March 29, 1956 (25 U.S.C. 483a), authorizing the execu- and approval of mortgages and deeds of trust on individually ed trust or restricted land, is proving of assistance to Indians in ining justified financing. They are now able to use their chief t, land, as security. Thirty additional loans, amounting to $256,- were obtained by Indians during the current reporting year ough the use of mortgages of their land as security.

n agreement was entered into during the year between the Valley ional Bank of Phoenix, Ariz., and the Hualapai tribe under which bank will make loans to members of the tribe on the basis of a ranty fund furnished by the tribal organization. This should ve of value in encouraging these Indians to look to the same chan- s as other citizens for financing.

## ancing Through Bureau

inancing through the Bureau receives secondary emphasis in the eau's program. At June 30, 1959, the following funds were olved:

| | |
|---|---|
| ds of Indian organizations | $22,972,052 |
| ns, revolving fund | 9,515,749 |
| nbursable loans | 123,968 |
| stock loans | 78,465 |
| Total | 32,690,234 |

ribes with funds of their own available are required to use their moneys to make loans and finance tribal enterprises before apply- for loans from the United States. At the close of 1959, a total of ,972,052 was in use, compared with $22,778,045 at the close of 1958.

he United States makes loans to tribes, other Indian organizations, individual Indians. Loans totaling $9,515,749 were outstanding he end of the year. A total of $2,526,705 was loaned during 1959. s amount has been exceeded in only 3 years since establishment of revolving fund was authorized in 1934.

Repayments totaled $1,302,310 during 1959, compared with $1. 061 the prior year. Loan delinquencies were $574,764, whic $194,937 less than at the close of 1958. A reserve of $1,437,847 established for potential losses or slightly over 15 percent of the receivable. At the close of the year, there was a cash balance o 115,005 available for general use. Against this sum were unadva commitments of $3,724,510 including an estimated $1,418,850 requ to make loans to withdrawing members of the Klamath tribe du 1960, pursuant to the act of June 11, 1959 (73 Stat. 70). This balance is inadequate to take care of the credit needs of those Inc unable to receive financing elsewhere. A recommendation was to the Congress that the revolving fund authorization be increase $15 million.

### *Use Made of Funds Loaned and Advances*

Indian organizations use their own funds and moneys borr from the United States to make loans to members and associatio members, and to finance business enterprises. The total finan through the Bureau was being used as follows at the close of year:

| | | |
|---|---|---|
| Loans to individuals: | | |
| Cash | $7, 113, 651 | |
| Livestock | 771, 833 | |
| | | $7, 88 |
| Loans to Cooperatives | | 191 |
| Loans to and invested in enterprises | | 19, 44 |
| Loans to attract industries | | 12 |
| Other: | | |
| Reimbursable loans | $123, 968 | |
| Repayment in transit | 2, 179 | |
| Cash on hand: | | |
| For relending | 2, 879, 433 | |
| For livestock operations | 268, 459 | |
| Other net assets | 1, 766, 555 | |
| | | 5, 04 |
| Total | | 32, 690 |

### *Loans to Individuals*

A total of 1,853 loans for $2,969,073 were made during 1959. is the largest number of loans and amount in 6 years, and is an incr of 850 loans for $425,797 over 1958.

Repayments on individual loans were $1,899,971, which was $739 less than in 1958. Of the loans receivable amounting to $7,113,65

al of $1,988,136 was owing on loans which were either delinquent
in process of liquidation. Interest payments of $130,898 also were
inquent.

### ans to Cooperatives

The outstanding balance includes $44,386 owed by two cooperative
ociations in Oklahoma which has been uncollectible for a long time,
which there is no authority to write off or cancel. These two
collectible debts originated in loans made in 1943 and 1950. Co-
eratives were carrying cash on hand of $623,071 to continue operations at the close of the year.

### ancing of Enterprises

Payments of $344,907 were delinquent. Enterprises were carrying
cash on hand at the close of the year $2,586,323 with which to con-
ue operations.

### ans to Attract Industries

In fiscal 1960 the Bureau made its first loan to a tribal organization
the purpose of attracting industrial development. This was to
Eastern Band of Cherokee in North Carolina and was in the
ount of $150,000. The tribe used the proceeds of the loan, together
h a matching amount of tribal funds, for the construction of a
lding with 75,000 square feet of floor space which was leased to a
nufacturing establishment. Initially, the industry will employ
out 150 workers, with preference given to Indians.

# *ureau of Land Management*

ward Woozley, *Director*

R 175 YEARS America's public domain has been furnishing land d natural resources to help meet the needs of a Nation that has own from less than 4 million people clustered on the eastern sea- ard in 1785 to more than 180 million citizens across 50 States.

Out of the public domain that once included about 1.8 billion acres ve been taken more than 1.1 billion acres to settle, develop, and use. one can know or measure the real value of the public domain's ntribution to the growth of the Nation.

Last year the public domain continued to fill its historic role, con- buting enough timber to build a 50-foot boardwalk from New York Los Angeles; enough oil to heat about 6 million American homes r a year; and forage for nearly 12 million livestock and big game.

In addition, the public domain managed by the Bureau of Land anagement of the Department of the Interior produced revenues the United States Treasury of more than $371 million—an all-time cord for any one year. Revenues during 1960 boosted total receipts BLM to more than $2.2 billion.

The following pages tell the story of BLM's important conserva- n activities during the fiscal year ended June 30, 1960. The report flects the significant accomplishments of the last year and the great ogress during the 1950's. It also portends much bigger jobs to be ne in the future.

## *Lands*

Americans are moving westward and to the suburbs. Industrial velopment is spreading to new areas. More and improved transpor- tion is changing the Nation. These changes are also changing the le of the public domain as these lands and resources become more d more significant to the Nation's growth and development. The

*Flash floods from the fire-scorched watershed swept through Boise on August*
*Tons of silt and muck were deposited on yards and streets.*

management of these lands for all of the people of the United Sta is even more important and challenging than ever before.

The Bureau of Land Management has responsibility for determ ing the desirability of proposed changes in public land ownership a working out the changes. In accomplishing these tasks, the Bure operates under authority of laws passed by Congress and regulati of the Department of the Interior.

## *Legislation*

Legislative activities during the year yielded important progre In Public Law 86–292, the Congress liberalized provisions of t Recreation and Public Purposes Act by (1) allowing States to acqu up to 6,400 acres each year for recreational purposes (with a tempora 3-year ceiling of 12,800 acres), and (2) confining the 640-acre limit tion for other purposes to individual programs rather than to inc vidual local governmental units. The reversionary clause previous limited to 25 years was made permanent.

Long-sought administrative improvements were achieved throu enactment of Public Laws 86–509 and 86–649. The former act term nates overlapping responsibilities of the Department of Agricultu and the Department of the Interior for national forest exchanges a al other national forest disposition laws. Except for mineral de- inations, cadastral surveys, and issuance of land patents (deeds) onsibility for exchanges and other transactions now rests with Department of Agriculture.

n July 14, 1960, the President signed Public Law 86–649, the ic Land Administration Act, which embodied a five-point pro- n to improve the efficiency of public land administration.

ne act authorized the Bureau of Land Management to conduct in- gations, studies and experiments and to enter into cooperative ements to carry out responsibilities with respect to the federally ed lands administered by the Secretary through the Bureau of d Management.

also authorized the Bureau to modernize fees required as service ges.

ne law additionally authorized BLM to rehabilitate lands damaged efaulting timber purchasers, and permitting the use of forfeited osits or bonds for that purpose. It will permit BLM to accept do- ons of money, services, or property for the improvement or man- nent of the public lands.

ne act also authorized users of roads or trails under the jurisdic- of BLM to deposit sufficient money to enable the Bureau to keep n in satisfactory condition.

he legislation affected only those services which the Department orms on a fee basis and did not affect rentals for actual use of the lic lands such as the grazing fees required by the Taylor Grazing

he rapidly expanding economy of the West, sparked by large ulation increases, has made urgently necessary new legislation for sale of lands for urban and business purposes.

nder terms of a bill proposed by the Department, BLM could sell o 1,280 acres of unreserved public domain land to private firms or ividuals or local government agencies.

he proposed Public Land Urban and Business Sites Act (H.R. 2) would be the first major new concept relating to the acquisi- of public lands since the Small Tract Act was passed in 1938. d sold under this bill would not be sold for less than its fair market ie. The bill would not apply to national forests, national parks, llife areas, or certain other lands in reserved status.

wo present gaps in the public land laws would be filled by H.R. 2. At the present time, the Government usually may not sell more n 5 acres of public land to an individual purchaser for commercial ndustrial development. Also, there is no means for making land ilable for urban and suburban residential development other than parcel-by-parcel basis.

The same influences that have led to increased needs for public lands have encouraged land speculators and promoters to ke advantage of the desire of people to acquire lands for homes, investment, or recreation. BLM and several States have taken a num-ber of countermeasures which on the whole, have proved very effe ve. Activities of promoters were substantially reduced.

Another needed bill was H.R. 6290, a bill to consolidate and mod-ernize the townsite laws, one of the Department's proposals for mod-ernization of the public land laws.

The Department of the Interior has recommended repeal o 1919 Pittman Act—originally designed to foster desert land recl tion in Nevada. The Department has asked repeal of this law cause it has notably failed in its original intent, and is now used principally for land speculation. Despite 40 years of opera under the act, only three economic farm units have develope

The Department has also asked for repeal of a law which al nonresidents of Nevada to file applications under the Desert Land In all other western States people must be residents of the Sta order to file applications.

The nonresident provision appears to have had no appreciabl fluence on the development of Nevada agriculture. From the sage of the act of January 6, 1921, through 1958 only 17 patents issued to nonresident entrymen. The nonresident provision has employed by unscrupulous land locators in bilking the public.

As another part of the legislative attack on speculation, the Dep ment has sponsored a bill by which land speculators would no lon be able to use an adjoining-owner preference right as a means of taining public lands put up for sale.

The bill is aimed at stopping speculative activities under the called Public Sale Act—a law which permits BLM to classify sell tracts of isolated or disconnected public domain lands up to 1. acres. Such lands are appraised and sold by competitive bidding

Under present law, the owner of land adjoining that which has b put up for sale has a preference right to purchase the tract at th times the appraised price or by matching the high bid, whichever less.

In the past, some land speculators have been able to take advant of this situation by buying a few acres adjoining the lands for s (sometimes even after the sale has been advertised) and then clai ing the preference right.

The proposed bill could clamp down on such speculative possibilit by limiting the preference right to adjoining land owners who o at least a legal subdivision and who have owned it for at least 1 ye or who have inherited the land.

*e seeding builds the productivity of the land, producing more feed for wildlife vestock and vegetation to hold the soil.*

### *ulations*

facilitate processing State exchanges, regulations were issued t will close public lands to the filing of new applications when the s have been applied for as part of a Federal-State land exchange. ie new rules will not permit the filing of additional applications oval of which are discretionary. State exchanges are essentially datory. The new rules will speed up processing of the States' ications by eliminating the need for processing applications which l not be approved.

nproved controls over billboards on Federal lands are provided in regulations to protect scenic value of the public lands.

ne new controls have as their minimum standards the highest dards set up by the Department of Commerce and by State gov- nents. But the regulations permit the Department of the Interior ise the safeguards in cases where the minimum controls would be equate.

### *udication and Classification*

ince almost all lands action involves adjudication, the number of losed cases and the cases closed per year give a general indication of the status of the program. During the past 6 years, there has b a tremendous backlog of work, due primarily to the filing of thou of applications.

During fiscal year 1960, an objective was established to reduc backlog within 5 years. Progress exceeded expectations.

Several substantial improvements in classification operations achieved during the year.

In certain areas where land locators have induced large-scale fi of agricultural applications for lands that are clearly nonagricul in character, the Department has adopted a combined decision-c fication to close the lands to further agricultural applications. I such action, taken in connection with a large number of ap actions, the Department classified more than 1 million acres in sout California for nonagricultural use. Applications under the agr tural land laws will no longer be accepted for the lands involve of which are not suitable for irrigated farm development.

*Adjudication of lands cases, Bureau of Land Management, fiscal year 19*

| Type of case | Unclosed cases, July 1, 1959 | New cases during year | Reactivated cases during year | Cases closed during year |
|---|---|---|---|---|
| Title transfers: | | | | |
| Homestead | 2, 977 | 2, 625 | 4, 423 | 6, 579 |
| Desert land | 6, 756 | 1, 629 | 862 | 5, 427 |
| Public sales | 3, 761 | 2, 084 | 141 | 2, 043 |
| Selections | 1, 244 | 903 | 214 | 755 |
| Exchanges | 948 | 280 | 33 | 362 |
| Land title cases | 3, 245 | 3, 242 | 1, 731 | 5, 363 |
| Small tract (unclassified land) | 21, 230 | 3, 567 | ---------- | 7, 516 |
| Small tract application and drawing (classified land) | 4, 950 | 575 | 4, 225 | 5, 460 |
| Small tract (auction) | 342 | 1, 464 | 86 | 1, 731 |
| Small tract (options) | 5, 259 | 16 | 4, 903 | 7, 207 |
| Recreation and public purposes sales | 454 | 232 | 95 | 228 |
| Total title transfers | 51, 166 | 16, 617 | 16, 713 | 42, 671 |
| Leases and permits: | | | | |
| Nonmineral leases | 108 | 76 | 44 | 79 |
| Rights-of-way | 1, 660 | 1, 909 | 1, 204 | 3, 377 |
| Nonmineral permits | 598 | 780 | 490 | 1, 452 |
| Nonmineral material sales | 13 | 124 | 89 | 179 |
| Recreation and public purposes leases | 99 | 97 | 25 | 92 |
| Small tract leases | 159 | 26 | 99 | 126 |
| Total leases and permits | 2, 637 | 3, 012 | 1, 951 | 5, 305 |
| Investigations: | | | | |
| Trespass | 4 | 4 | 1 | 3 |
| Other | 131 | 199 | 4 | 236 |
| Total investigations | 135 | 203 | 5 | 239 |
| Other tenure actions: | | | | |
| Withdrawals and reservations | 662 | 132 | 82 | 274 |
| Revocations and restorations | 330 | 261 | 84 | 169 |
| Offers of excess land | 3 | 24 | 2 | 24 |
| Total other tenure actions | 995 | 417 | 168 | 467 |
| Total | 54, 933 | 20, 249 | 18, 837 | 48, 682 |

areas where continued retention of lands in Federal ownership
ultiple use management, including management for public rec-
on, was indicated, the lands were classified under section 7 of the
r Grazing Act.

ese two improvements in classification techniques represent con-
tive steps to make classification decisions in a more orderly and
ctive manner. This reduces the expenditure of public funds on
roductive rejection of applications, thereby freeing manpower
nstructive activities. In addition, it eliminates the public frus-
n which results from being allowed to file applications which
later be rejected.

ntinued improvement was also made in the lands appraisal ac-
. Area and State reviewing appraiser positions were estab-
l in fiscal year 1960 to insure that all Bureau land-appraisal per-
l receive the best possible advice on appraisal matters. Increased
asis was placed on formal training and informational programs
p all appraisal personnel up-to-date on the latest developments.

### *ic Recreation Land Use*

tdoor recreation is a resource of land which requires manage-
. State and local governments are becoming more involved in
ation planning, and in many areas are looking to the public
in to help fill their recreation needs. During 1960, outstanding
ess was made in the development of Bureau policies and pro-
s for public recreation.

der the Recreation and Public Purposes Act, vacant and unre-
d land most suitable for public recreation has been classified by
ureau for lease or purchase by State or local governments, and
rofit organizations at reduced cost. Approximately 30,500 acres
western States were classified for transfer or use under this
uring 1960.

e Bureau's inventory of public domain lands having some special
ation value continued during the year. Preliminary estimates
ate that over 4,300 sites containing more than 19 million acres of
c domain will be identified as having particular recreational

actically all vacant unreserved public domain lands along the
ic Coast have been classified for potential recreation use. Forty-
reas of high recreation potential have been identified in southern
ornia, ranging from 40 to 300,000 acres.

ntinued public use of more than 500,000 acres of public domain
within an area of more than 1,200 square miles in the Steens
ntains of eastern Oregon has been provided for by a BLM classi-

*Earth dams will hold the water and prevent the water from running off to ast Many such dams have been built by BLM on western rangelands.*

fication action which dedicates the area for retention in Fe ral ownership as a multiple purpose land management area. The as-sified area contains some of Oregon's finest deer-hunting lands.

Classification of the lands as a balanced multiple purpose l nd management area marks one step in the BLM program to wor ut long-term cooperative plans for the use and development of the ea including cooperative financing of the construction of access ods and public recreation facilities.

Classification action was also completed on the Lower Desc es River land management area by an agreement with the Oregon sh and Game Commission providing ample tenure for the develop ent necessary to protect, preserve, and foster access to this natio ly known fishing area.

Under the Recreation and Public Purposes Act, Arizona's Mari pa County has pending lease applications covering approximately 6 ,0 acres in six areas surrounding Phoenix. The tracts range from ,0 to 28,000 acres and are planned for development as regional aks under the county Parks and Recreation Department.

Jtah has initiated the development of a State park system esti- ted to include public domain land for 60 major areas and many ıller areas for parks, campgrounds, roadside areas, and historic s.

## tispeculation *Activities*

uring fiscal year 1960, emphasis was placed on an intensified pro- m to inform the public of their rights and privileges under the lic land laws, and to publicize and implement the Department's ispeculation policy.

his policy strengthens public safeguards by making it virtually ossible to use land exchanges under section 8 of the Taylor Graz- Act and other land laws to make windfall profits by acquiring lic domain lands at less than fair market value. Many appli- ions pending at the time the policy was introduced had to have litional evidence supplied by the applicant, or had to be rejected.

he new policy statement on Federal-private land exchanges con- ns five principal safeguards:

. The Government will no longer approve exchanges involving ple who do not actually own and hold title to the lands they are ring for exchange. Formerly it had been possible for people to ke exchanges on the basis of options and purchase agreements.

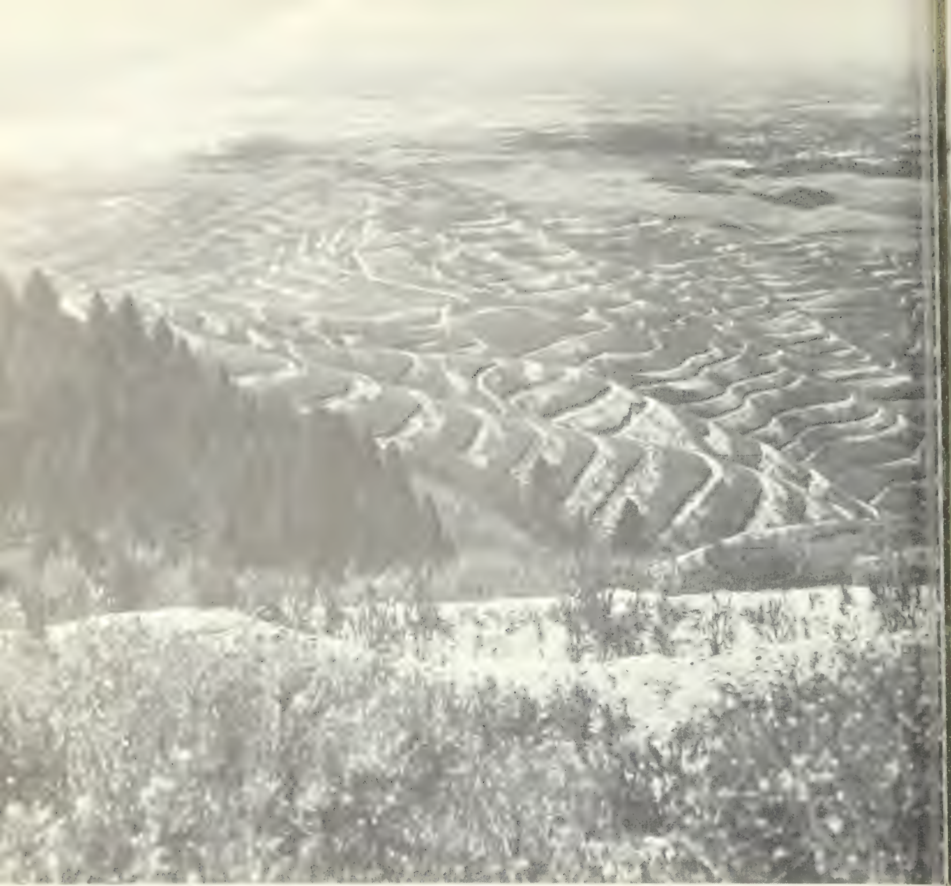
. As a matter of policy, BLM will not approve any exchanges in as where the real estate market is so unstable or uncertain that ues cannot be established with confidence.

. No exchanges will be approved where there is a marked dis- ilarity in location or character of the offered and selected lands. der the law, the value of the selected lands may not exceed the ue of the offered lands. Marked dissimilarity works against equat- of values.

. Exchanges will not be approved unless there would be a clear l positive benefit to the Government with the likelihood that the ds gained by the Government will remain in the Federal ownership many years for resource conservation purposes. The mere fact t an exchange will result in "blocking up" Federal ownerships ll not, in itself, be regarded as meeting the legal requirement that exchange must be "in the public interest."

5. When the Government blocks out land-ownership patterns for nagement purposes, private land exchanges will only be used when t means would clearly be a more economical and effective way to ain the lands than by direct purchase or condemnation proceedings.

ther policy safeguards were adopted in connection with public es and other transactions.



*In addition to contour trenching on the Boise watershed, grass seed was drill every critical acre of public domain land that machinery could reach. Broa seeding was done on areas too steep to drill. Note the drilling furrows a the trench on the left.*

## *Land Selections*

It is the policy of the Bureau to take final action on outstan valid scrip and State selection rights as soon as possible.

There was very little scrip activity outside of California where filing of scrip increased greatly during fiscal year 1960. The majo of this scrip has been filed on lands of substantial value, and in cases a number of conflicting applications are involved.

Most States have nearly exhausted their selection rights. Howe in Alaska, the State's land selection activities are very import The Statehood Act granted Alaska selection rights to an area lar than California. Alaska has 25 years to complete these selecti So far, selections totaling about 4 million acres have been con trated in the Anchorage district and include virtually all of the cessible lands in the Kenai Peninsula, Matanuska, and Susitna leys, plus other areas of the Tanana, and Nenana River Valleys.

### *'l Tracts*

ong public interest in small tracts continued in fiscal year 1960. oximately 10,000 sales were made of over 38,000 acres. Several were opened to small-tract application, including one near the e Sands Missile Base to provide homesites for missile workers.

### *drawals and Restorations*

1960, 256 public land orders withdrew 180,163 acres of public in lands and restored 1,259,880 acres from withdrawn status. ontinual review is carried out by all Bureau offices to determine sting withdrawals are still serving their purposes. During fiscal 1960, withdrawals totaling about 105,285,000 acres were reviewed.

## *Minerals*

e of BLM's more important responsibilities is conservation and opment of publicly owned mineral resources. There have been asing demands for nearly all types of minerals. BLM has ac- pursued a program to encourage the location and development luable mineral deposits on public lands by private enterprise. a program is absolutely necessary for national defense and, of e, it benefits private enterprise and local economies.

rtain minerals may only be leased for development—oil and gas, h, sodium, phosphate, coal, and, in Louisiana and New Mexico, ur. Mining claims may be staked for other minerals under the d States mining laws. The holder of a valid mining claim, upon ng the legal and regulatory requirements, may obtain patent to inerals and the land (plus any surface resources then on the ).

e Bureau's overall program in fiscal year 1960 resulted in im- d and accelerated public service. BLM sought during the year pedite, through the promulgation of new regulations and pro- es, the adjudication of all mineral leasing applications and . During the year a study was launched to find methods which simplify the procedure for obtaining a mineral patent.

M's minerals program contributes to many local and State econ- . The States share in the income derived from mineral leasing blic lands, and the funds are used for roads, schools, hospitals nany other public facilities.

### *ral Production From Federal Lands*

oduction of minerals from federally owned lands during fiscal 1960 showed increases in all commodities. From public lands came more than 147,100,000 barrels of petroleum, 462,100,000 r (thousand cubic feet) of natural gas, some 13,014,000 tons of po 5,419,000 tons of coal, 1,410,000 tons of phosphate rock, 159,000 of silica sand, 1,013,000 tons of sodium salts, and 130,000 tons of phur, plus other minerals in smaller quantities. There was a crease of more than 10 million barrels of petroleum from the p States and Rocky Mountain areas during 1960. Petroleum pro tion in Alaska amounted to some 209,000 barrels, the first repor commercial oil production from the new State.

Oil and gas leasing has continued at a high level, with substa increases in Outer Continental Shelf leasing. Total oil and gas l increased from 138,400, covering less than 112 million acres on 30, 1959, to nearly 147,000 leases covering about 121 million acr June 30, 1960. The biggest increases occurred in Alaska, Ari Colorado, New Mexico, Utah, and Wyoming.

Petroleum production from the Outer Continental Shelf incr by 5,041,696 barrels, and acreage under oil and gas lease increase 340,866 in fiscal year 1960. Gas production from this area incr by 29,181,672 thousand cubic feet.

As provided in the Mineral Leasing Act the States received ments as their share of the revenues from Federal mineral lea Payments during 1960 totaled more than $34,700,000.

Protective oil and gas leases within Camp Breckenridge, Ky. the Barksdale Air Force Base, La., were issued by the Bureau to tect the United States from drainage by wells on adjoining priv owned lands. Jurisdiction over the mineral deposits in the had previously been transferred by the Department of Defense t Department of the Interior. The lands were leased competit for bids that totaled $989,307.

The first competitive salt lease bid opening on Outer Contin Shelf lands was held in 1960. The lands were already under eral oil and gas and sulphur leases. Leasing of the lands for sal velopment will result in production of oil, gas, sulphur, and salt the same leasing blocks. A bonus of $75,250 was received fo 2,500-acre salt lease.

## *Oil and Gas Leasing in Alaska*

The marked interest in oil and gas leasing in Alaska continued ing the past year. The number of oil and gas leases in Alask creased from 15,100 to 16,500. The area under lease in Alaska increased by almost 2 million acres to a new high of more than million acres. There are 13 producible wells in Alaska—9 for oi 4 for gas. Eleven of these wells were completed during the last

t a competitive oil and gas lease bid opening in Fairbanks, Alaska,
M opened high bonus bids totaling $206,000 on 16 tracts covering
5 acres in the Gubik gasfield, adjacent to Naval Petroleum Re-
e No. 4 and abutting the west side of a 16,000-acre area already
er lease.

he bid opening held in early 1960 was the second Federal competi-
oil and gas leasing of Alaska lands, both of which involved
ls in the Gubik gasfield. The latest area leased lies within a 2-
buffer zone established around Petroleum Reserve No. 4. Leas-
of the area was recommended by the Secretary of the Navy to
vent loss of revenues through drainage resulting from nearby
elopment.

rivate development firms have let contracts during the year for
struction of two major pipelines in Alaska. One will run from
Swanson River-Soldotna Creek oilfield to docking facilities at
ishka on Cook Inlet. The other will run from the Kenai gasfield
nchorage, supplying that city with its first natural gas and open-
the way to expanded resource industries in the community.

### *ulations*

il and gas lease operators' drilling bonds have been raised from
00 to $10,000 to increase protection to the surface owners of land
er oil and gas lease.

rilling bonds protect surface owners from damages to crops and
rovements on lands leased by the Federal Government for oil
gas development.

he $10,000-bond rate is based on rising monetary values of land
rovements. The old $5,000-bond rate has been in effect since the
oil and gas leases were issued under the Mineral Leasing Act of

ew cooperative safeguards over Federal oil and gas leasing have
lted from amendments to the oil and gas leasing regulations.
y apply specifically to so-called acquired lands in which the sur-
of the land is no longer in Government ownership but in which
ninerals have been reserved.

he regulations permit the surface owners of acquired lands to sug-
safeguards and special leasing conditions which would apply to
mineral leases issued by the Federal Government for subsurface
eral deposits. The regulations specifically apply only to cases
re the surface of the land is owned by a State or local government
ncy or nonprofit educational, charitable, or religious group.

LM will notify the surface owners about any application for lease
will give them an opportunity to suggest any necessary safeguards

*New growth now blankets this area that was burned over 40 years ago. M*
*of seedlings are planted each year on burned and cut over areas to hasten th*
*when a new forest crop will be available for harvest.*

to protect the surface use of the lands. This procedure has bee
formally practiced by the Bureau of Land Management and is
spelled out in the official regulations.

Other new regulations cover filing procedures on wildcat l
where an existing lease is canceled, expired, relinquished, or te
nated. The new regulations do not affect regular 5-year exten
of existing leases.

e new system calls for a 5-day period each month during which ications may be filed for lands involved in the previous month's eled, relinquished, expired, or terminated leases. The 5-day pe- follows the third Monday of each month or the next working day onday is a holiday. On that Monday each BLM Land Office s a notice on the bulletin board listing the lands available.

l applications received during the 5-day period each month are ed as if they had been filed simultaneously. Priorities of appli- ns will be determined by a public drawing.

e changes in the method of filing applications afford all in- ted parties an equal opportunity to apply for lands formerly r lease. They save much wear and tear on the public land rec- . The old system had placed a premium on making rapid searches and Office records each morning to find lands newly available for ng.

e new regulations became effective in January 1960. The first of lands were posted in some Land Offices later the same month. than 14,000 lease offers were received by the Land Offices in uary. Approximately the same number were received in subse- t months.

w oil lease regulations require that simultaneous offers for oil gas leases be accompanied by guaranteed negotiable remittances, ring advance lease rentals, not merely checks which might be n against insufficient bank deposits. Only cash, money orders, fied checks, bank drafts, or bank cashier's checks are now accept- to cover advance rentals. Filing fees are payable by uncertified ersonal check. Under the old system an unscrupulous person l file numerous offers accompanied by checks drawn against in- ient funds.

na fide purchasers of oil and gas leases who conform to Federal ge limitations are now protected against loss of their leases even e previous owners of the leases violated those limitations.

e Code of Federal Regulations has been amended to include the isions of a law approved by Congress on September 21, 1959. The protects the title or interests of anyone who in good faith acquired se or interest in a lease. Such bona fide purchasers will be dis- ed from any cancellation or forfeiture proceedings brought nst another party for abuse of Federal acreage regulations.

### *slation*

gislation to repeal the waiver of the second and third years' rental oncompetitive oil and gas leases and to increase the minimum ge rental from 25 cents to 50 cents per acre per year has been sponsored by the Department. The legislation was passed by Congress and approved by the President shortly after the end of fiscal year. The present regulations require payment of 50 cents acre for the first year and 25 cents per acre for the fourth and f years. Rental for the second and third years is waived. The re increase will encourage exploration and help remove the incentive speculation in leases. Under this legislation, the Government is pected to receive more than $62 million in additional revenue by 1

Other legislation sponsored by the Department would prevent subdividing of Federal oil and gas leaseholds into leases covering than 640 acres.

The proposed minimums would protect unwary investors aga misleading advertising promotions which imply that many aver citizens can "strike it rich" by speculating in a subdivided lease co ing a small holding, usually 40 acres.

One necessary exception would be where the entire acreage of existing valid lease is less than 640 acres.

## *Other Mineral Activities*

Public Law 167 activities continued at a high level during fiscal y 1960. Under this law the Federal Government has the right manage the surface resources, including timber and forage, on unpatented mining claims staked after July 23, 1955. For all cla staked before that date, the Government may gain the right manage the surface resources under a legal procedure provided fo the law.

The law was passed as a conservation measure to prevent min claims from being staked or used for nonmining purposes and to vent timber waste. Before the law was passed, neither the Gove ment nor a miner could legally harvest the timber on an unpaten mining claim.

The legal actions spelled out by the law require BLM to exam areas to see if there are any unpatented mining claims. Follow examination, a notice is published stating that a determination surface rights on mining claims will be made. A miner may cho not to respond to the notice—in which case he loses no mineral mining rights whatsoever, while the Government acquires the righ manage the surface resources. Or he may file a so-called veri statement.

If a miner files a verified statement, BLM then determines whethe the specific claim is valid under Public Law 167. If it is valid, Government will not gain the right to manage the surface. If i not valid, the Government obtains the right to manage the surf rces. Public Law 167 proceedings, however, are not used to dene the validity of a mining claim for patent purposes. Under c Law 167 proceedings no miner loses any possessory rights in ction with his mining or his rights to mine and to use as much surface as is necessary in his operations.

the close of the fiscal year, the Bureau completed preliminary exations on 5,213,884 acres, with 5,072,965 acres having been publ. This resulted in the filing of 505 verified statements for 2,532 ıg claims. Over three-quarters, or 2,065 claims, have been examıs a result of filing verified statements.

ermination of surface rights has been completed on nearly 90 nt (4,734,408 acres) of the acreage under preliminary investiga- Of the claims examined, the Government did not acquire suresource management rights on 560 claims.

addition to the program on public domain lands, BLM published s or received requests to publish notices from the United States rtment of Agriculture on 74,836,766 acres and has processed veritatements involving 16,137 mining claims. Closing decisions, leting the determination of 23,933,781 acres, have been issued. Government did not acquire surface management rights on 294 s.

es of materials other than timber under the Materials Act during year 1960 amounted to $91,226.12. The free use permits issued alued at $748,428. The greater percentage were for sand and l for road construction.

der the general mining laws, the Bureau of Land Management l 305 cases involving title transfers. New and reactivated cases d 284. Mineral patents issued showed an increase over the prefiscal year. 168 patents were issued for 28,015 acres of mineral luring fiscal year 1960.

blic Law 359 permitted the location of mining claims on lands rawn for powersite purposes. By the end of 1960, 11,380 claims een staked on these lands and recorded in the Land Offices.

blic Law 357 permitted mining claims for uranium on public classified or known to be valuable for coal. It also provided ne extraction of uranium intermingled with lignite with the ent of 10 cents per ton for any lignite removed. On June 30, claims had been located on public lands (most of which were in ı Dakota) and recorded with BLM.

California a great deal of speculation has resulted from mining promoters purporting to "locate" mining claims and do annual ment work for others. For the most part, the claims are located eas of rapid expansion and rapidly changing land values. All 'claims" investigated so far have been found to contain no min-

*Forest harvest patterns make the mountains look like they have been clipped th giant shears. In old growth Douglas fir clear cutting patterns will be in ev aged blocks of second growth. Intolerant of shade, Douglas fir must be harv d in blocks so the new trees all grow up together.*

erals. The Bureau is taking aggressive action against invalid cla s. so that the questionable practices of these promoters will be exp d and stopped.

## *Lands and Minerals Appropriations*

The lands and minerals activity of the Bureau of Land Managem t includes a complex array of classifications and field investigat s, adjudication, and a records modernization program, plus the pu c service operations of the Bureau's Land Offices. Total BLM ap o- priations for the lands and minerals activity in fiscal year amounted to $7,205,200.

*ijudication of mineral cases, Bureau of Land Management, fiscal year 1960*

| Type of case | Unclosed cases, July 1, 1959 | New cases during year | Reactivated cases during year | Cases closed during year | Unclosed cases, June 30, 1960 |
|---|---|---|---|---|---|
| ransfers: | | | | | |
| neral entries (BLM and other) | 502 | 176 | 19 | 213 | 484 |
| neral entries (Forest Service) | 263 | 74 | 15 | 92 | 260 |
| nd disposition conflicts | 775 | 2, 766 | 4 | 942 | 2, 603 |
| neral classification | 106 | 85 | 2 | 141 | 52 |
| 'otal title transfers | 1, 646 | 3, 101 | 40 | 1, 388 | 3, 399 |
| s and leases: | | | | | |
| and gas noncompetitive (public omain) | | 113, 639 | | | |
| and gas competitive (public omain) Total | 18, 069 | | 34, 557 | 139, 231 | 27, 034 |
| and gas noncompetitive (acquired ınds) | | 3, 004 | | | |
| and gas competitive (acquired ınds) | 2, 240 | | 1, 763 | 4, 494 | 2, 513 |
| and gas assignments and transfers | 7, 261 | 27, 739 | | 28, 566 | 6, 434 |
| and gas overriding royalty assignments | | 7, 840 | | 7, 840 | |
| ıer permits and leases | 57 | 13 | 243 | 260 | 53 |
| ıl | 318 | 195 | 267 | 445 | 335 |
| assium | 421 | 257 | 807 | 1, 291 | 194 |
| )sphate | 26 | 107 | 25 | 48 | 110 |
| ium | 885 | 385 | 528 | 1, 439 | 359 |
| ·drock | 480 | 171 | 266 | 682 | 235 |
| ıeral material sales (common varieties) | 39 | 194 | 54 | 213 | 74 |
| ;er Continental Shelf (sec. 6) | 33 | 191 | 2 | 218 | 8 |
| otal permits and leases | 29, 829 | 153, 735 | 38, 512 | 184, 727 | 37, 349 |
| nbursable investigations: | | | | | |
| face management (BLM and other) | 1, 167 | 271 | 159 | 845 | 752 |
| face management (Forest Service) | 10, 054 | 4, 033 | 489 | 4, 410 | 10, 166 |
| versite mining claims (BLM) | 735 | 164 | 802 | 1, 357 | 344 |
| versite mining claims (Forest Service and her) | 56 | 456 | 31 | 379 | 164 |
| ıeral claims and leases | 181 | 91 | 2 | 134 | 140 |
| ltiple use conflicts (non-title transfer) | 852 | 150 | 149 | 586 | 565 |
| cial laws | 841 | 3, 438 | 266 | 1, 311 | 3, 234 |
| nium-coal mining claims | | 21 | | 16 | 5 |
| er compliance | | 7 | | 1 | 6 |
| otal investigations (nonreimbursable) | 13, 886 | 8, 631 | 1, 898 | 9, 039 | 15, 376 |
| rsable investigations | 3, 477 | 10, 871 | 137 | 10, 700 | 3, 785 |
| otal minerals adjudication | 48, 838 | 176, 338 | 40, 587 | 205, 854 | 59, 909 |
| rand total | 103, 771 | 196, 587 | 59, 424 | 254, 536 | 105, 246 |

*Areas leased and bonuses received, competitive mineral leases, Bureau o*
*Management, fiscal year 1960*

| Type of mineral and State | Public domain lands |  | Acquired lands |  | Total |
|---|---|---|---|---|---|
|  | Acres leased | Bonus received | Acres leased | Bonus received | Acres leased |
| **Oil and gas:** |  |  |  |  |  |
| Alaska | 9,105.00 | $206,027.10 |  |  | 9,105.00 |
| Arkansas | 408.28 | 253.13 | 3,682.68 | $2,246.58 | 4,090.96 |
| Colorado | 1,394.00 | 102,518.00 |  |  | 1,394.00 |
| Kansas | 80.00 | 1,269.60 | 160.00 | 2,817.60 | 240.00 |
| Louisiana | 199.70 | 2,091.20 |  |  | 199.70 |
| Mississippi |  |  | 100.02 | 2,500.50 | 100.02 |
| New Mexico | 3,036.00 | 301,405.00 |  |  | 3,036.00 |
| Oklahoma | 137.00 | 9,575.00 |  |  | 137.00 |
| Utah | 240.00 | 195.84 |  |  | 240.00 |
| Virginia |  |  | 402.00 | 2,042.16 | 402.00 |
| Wyoming | 2,961.71 | 33,796.50 | 40.00 | 2,127.60 | 3,001.71 |
| Total oil and gas | 17,561.69 | 657,131.37 | 4,384.70 | 11,734.44 | 21,946.39 |
| **Coal:** |  |  |  |  |  |
| Colorado | 1,958.00 | 6,575.00 |  |  | 1,958.00 |
| Utah | 1,160.00 | 1,240.00 |  |  | 1,160.00 |
| Wyoming | 1,240.00 | 1,240.00 |  |  | 1,240.00 |
| Total coal | 4,358.00 | 9,055.00 |  |  | 4,358.00 |
| **Sodium:** |  |  |  |  |  |
| California | 10.00 | 26,000.00 |  |  | 10.00 |
| Wyoming | 4,973.24 | 69,037.40 |  |  | 4,973.24 |
| Total sodium | 4,983.24 | 95,037.40 |  |  | 4,983.24 |
| **Mica:** |  |  |  |  |  |
| Idaho |  |  | 40.00 | 40.00 | 40.00 |
| **Diatomaceous earth:** |  |  |  |  |  |
| New Mexico |  |  | 160.00 | 328.00 | 160.00 |
| **Phosphate:** |  |  |  |  |  |
| Montana | 400.00 | 4,020.00 |  |  | 400.00 |
| Utah | 1,806.88 | 2,811.00 |  |  | 1,806.88 |
| Total phosphate | 2,206.88 | 6,831.00 |  |  | 2,206.88 |
| Grand total | 29,109.81 | 768,054.77 | 4,584.70 | 12,102.44 | 33,694.51 |

## *Public Land Surveys*

In 1785 the Continental Congress spelled out the basic pl survey of the lands which had been relinquished to the new N by the 13 Colonies. That land was the nucleus of the public d of the United States. The plan of survey provided for divisi the lands into townships 6 miles square, each township being divided into 36 sections 1 mile square, with the boundaries ru due north, south, east, and west.

That plan of survey of the public lands, with slight modific has been followed since that time. The plan is simplicity itsel results in a vast rectangular pattern. The orderly fields, laid squares which may be seen in a cross-country flight, illustrat regularity of this plan of survey.

This system of survey, which is the simplest coordinated s of land subdivision that history has recorded, is a necessary er to any comprehensive plan of land and resource management. ic land surveys under the rectangular system are called cadastral eys—a major responsibility of the Bureau of Land Management. dastral surveys include not only the original survey of the public s but also the resurvey of those areas where old corner monuments been obliterated or destroyed by the elements or by man in the ruction of improvements. By far, the major portion of the rveyed area of the public lands is in Alaska. The resurvey work nfined almost exclusively to 11 western States where most of the ic lands are located.

e public land surveys in fiscal 1960 saw the virtual completion ie program of survey of school-land grants in Utah. Major iasis was placed on the surveys and resurveys necessary in the igement of the timber resources, particularly in Oregon and ornia, and to the surveys necessary for providing homesites for apidly expanding populations of California and Arizona.

e program also was geared to the needs for boundary determina- n the administration of the Federal range and for the develop- of mineral resources.

Alaska the program was directed principally to surveys of lands ed by the State under its 103-million acre statehood land grant. ring fiscal year 1960, surveys and resurveys embracing 1,405,488 in the public-land States were officially accepted. Of this approximately 68 percent were resurveys. Additionally, field was completed in the survey and resurvey of 1,739,263 acres. other surveys which cannot be measured on an acreage basis also completed in the field during the year.

penditures by the Bureau of Land Management for cadastral ys totaled $3,016,616. Cadastral surveys were undertaken for Federal agencies on a reimbursable basis at a total cost of 395, while the Bureau received private contributions of $51,643 dastral surveys.

### *ka Surveys*

handle the surveys of State land-grant selections, BLM has in- d its surveying organization in Alaska. During the year, the y of 432,050 acres was completed in the field of which 297,868 were on large special and rectangular survey projects of State ions. Much of the remainder was indirectly connected with selections involving the identification of lands to which indi- l rights had been attached.

he expanded program in Alaska, new survey concepts and tech- s have been developed and employed involving the use of electronic distance measuring devices, photogrammetric procedures, improved instrumental equipment.

During the year, the State of Alaska filed selections totaling al 4 million acres, indicating need for even further expansion of program if satisfactory progress is to be maintained in survey the exterior boundaries of State selections and the boundaries uncounted thousands of private land claims inside the selected ar

## *Protraction Surveys*

Following the successful use of protracted surveys of leasing bl on the Outer Continental Shelf, BLM decided to extend the pla rectangular surveys over the unsurveyed areas in Alaska and larger tracts of unsurveyed public land in other States. Protra surveys are lines drawn on maps that follow the public land su system, even though the boundaries have not yet been laid out on ground. This will facilitate mineral leasing by replacing the com cated metes and bounds land descriptions with the simplified desc tions of the public land survey system. The protractions also fit the orderly development of the new public land records.

In Alaska, the protractions will help the State make selections will simplify the surveys necessary to define the exterior bounda of selections.

During the year, protraction folios covering approxima 284,565,000 acres in Alaska were completed. Of these, 870 prot tion sheets embracing approximately 250 million acres were offici approved and made available for use in oil and gas leasing and o purposes.

In addition, 92 protraction sheets over unsurveyed areas in Ariz New Mexico, and Montana were officially approved during the y

## *Outer Continental Shelf*

The United States Supreme Court held that the boundarie Texas and Florida in the Gulf of Mexico are three marine lea from the coast while as for Louisiana, Mississippi, and Alaba State boundaries are three geographic miles from the coast U.S. 1 [1960] and 363 U.S. 121 [1960]). However, the Court not specify what constituted the coastline from which these dista are to be measured.

During fiscal year 1960, the Bureau of Land Management conti work with the State of Louisiana and the Coast and Geodetic Su to map the line of low water along the coast of Louisiana. This ect has been undertaken to reach agreement on the line of low w

*destroys—This Alaska fire will soon have men on it, as BLM moves in to check*
*estructive forces of wildfire.*

basis for settlement of many issues involved in administration
he resources of the Outer Continental Shelf off Louisiana.
uring 1960, lease block maps were prepared covering some 6,600,-
acres of submerged lands off the coast of Louisiana and 3,400,000
s off Texas. These maps extend the lease block system to approxi-
ely 100 fathoms (600 feet).

## *Forestry*

orests are one of the Nation's most valuable renewable natural
urces and wood fibre one of its most useful raw materials. The
eau of Land Management's responsibility for more than 160 mil-
acres of public forest and woodland occupies a prominent place
he Department's integrated resource conservation program.
he post World War II years, especially the past decade, have
important changes in the Nation's forestry outlook. Although
oer continues as the Nation's primary use of wood, there has been
omenal growth in the use of wood pulp and plywood. One of
ignificant conservation achievements in recent years has been the

conversion of huge quantities of formerly wasted sawmill res ues into chips for pulp. It has been estimated that the equivalent at least 1½ billion board feet of waste is converted into pulp and per each year without causing any added drain on the Nation's su ply of standing timber. This is just one illustration of how the N on in getting more out of what it has.

The forest lands administered by the Bureau of Land Manage nt fall into two principal categories: First, the revested Oregon nd California Railroad grant lands and the Reconveyed Coos Bay W on Road lands in western Oregon, which together are referred to a he O&C lands; and, second, the public domain forest lands in the we rn United States.

During 1960 Bureau appropriations for forestry amounte to $6,037,700. This includes all forest management and develop nt plus fire contract protection.

## *The Western Oregon Forest Lands*

BLM's forestry program for the Oregon and California Rail d grant lands (O&C) and Coos Bay Wagon Road lands (CBWR) ds with one of the most challenging management problems in Ame n forestry. Encompassing about 2.1 million acres, these lands - tain some of the finest, high quality, old growth timber in the Na n.

Since 1937 the U.S. Treasury has gained more than $28 mi n over and above all cost of acquiring, holding, and managing e lands This rapidly growing Treasury surplus, most of which s accumulated since 1951, is already more than four times as muc s the original cost of the O&C lands.

The annual harvesting of timber on these lands is limited to r sustained yield capacity. Their average annual capacity, base n an intensive inventory of the growing stock was recalculated at 72 million board feet in 1959. As reforestation and other silvicult l practices are intensified, the timber yield is growing.

During fiscal year 1960, salvage sales and improvement cutting n second growth stands added enough volume to the allowable cu to that a total of more than 1 billion board feet of timber was sold. he total sale price was $34,328,520.48. Both of these figures—vol e and value sold—represent new all time records.

Actual O&C timber sale receipts during fiscal year 1960, base n collections from timber sale contracts amounted to $28,210,531 ; collections from sales on CBWR lands came to an additi l $1,311,004.64.

The O&C project is one of the most successful forestry enterpr s of the Federal Government. Despite the cutting of more tha on board feet of timber since 1937, the volume of timber on these ls today is greater than when the management program was initi- . During the past 10 years the gross forest income per acre has vn a spectacular increase. In 1951 it was $3.13. In 1960 it was 76.

he importance of the rising level of timber production under good agement over the decade is emphasized when it is realized that sts provide more than half the industrial employment in Oregon. h million board feet cut provides year-round employment for at 15 industry workers and other employees of dependent service istries.

## *lic Domain Forest Lands*

thirteen western States, the Bureau of Land Management ad- sters about 33 million acres of public domain forest lands, of ch some 4 million acres are classified as commercial forest lands about 29 million acres as woodland.

ne general management objectives for the commercial forest lands nese States is much the same as for the O&C lands. Long-term agement, however, is complicated by the fact that these lands are ect to application for entry and possible transfer out of Federal ership under the public land and mineral laws. Much of the nercial public domain forest land exists in fragmented, wide- ad tracts.

hen timber is sold on these lands, the mature and overmature age ses are designated for cutting. This plus other measures, such re protection, leave the cutover lands in permanent productive lition.

1951 sales from the commercial public domain forest lands unted to 83.7 million board feet valued at $1,348,151. By 1960 the me of timber sold had increased to 138 million board feet valued 2,362,000.

ne 29 million acres of public domain woodland exist in large, -consolidated blocks, in BLM grazing districts but have little mercial value at the present time. Most of this acreage is covered juniper-piñon pine, scrub oak and other woodland types. These s are important as a source of fence posts and other materials in range conservation structures.

## *ska Public Domain Forest Lands*

Alaska BLM is responsible for some 125 million acres of forest , about 40 million acres of which have timber of size and quality parable to commercial timber in other parts of the United States.

Much of the timber of interior Alaska is spruce which has pote
value for pulp and paper.

The Alaska Statehood Act granted authority to the State to s
103 million acres of unappropriated and unreserved public do
land. It is expected that the new State will select a large part o
better forest lands currently administered by the Bureau.

In the meantime, BLM is continuing with its program to ma
the Alaskan public domain forest resources, placing particular
phasis on improving the forest-protection program.

In 1959 BLM sold 9.7 million board feet of timber in Alaska va
at $27,099. In 1960 sales had risen to 14.7 million board feet of
ber valued at $61,447.

## *Reforestation*

Reforestation quite commonly has been a job of nature. U
favorable circumstances and expert planning this can be a succes
and generally economical method of obtaining reforestation. H
dreds of thousands of acres of the O&C lands show the succes
results of skillful use of natural reforestation techniques.

When nature fails to do a satisfactory job of reforesting l
of high commercial forest potential, BLM accomplishes the task
planting seed or nursery grown seedlings immediately after logg
Since prompt reforestation by these methods shortens the natu
rotation period required for growing the next crop of timber by
average of 10 years or more, this is good forestry.

A summary of reforestation activities on O&C and CBWR la
during 1960 shows that 6,531,000 seedlings were planted on 12,
acres and 6,869 pounds of seed were sown primarily by helicopter,
9,388 acres. Since 1950 more than 110,000 acres have been reforest

Most of the costs of this reforestation work are financed by fu
voluntarily contributed for the purpose by the 18 O&C counties
part of their share of O&C income which they make available annua
for access roads, reforestation, and recreation.

In 1956 the Bureau initiated a program to reforest selected blo
of potentially productive public domain forest land. By the end
1960, 4,463 acres had been seeded or planted under this program.

## *Access Roads*

With the decrease in the amount of privately owned timber s
on the open market, providing access to large areas of BLM adm
istered public timber has become one of the major features of t
forestry program of the Bureau of Land Management.

velopment of a competently engineered system of forest-access is essential for the orderly harvesting of the full annual allow- cut. A permanent network of roads permits the use and con- tion of large volumes of good timber which otherwise would be It also permits development of outdoor recreational facilities ly available to the public, and enables better protection of the ts from fire, insects, and disease.

e BLM road program, inaugurated in 1950, provides access to timber where high construction costs either preclude construction gh timber sale contracts or would necessitate excessively large

BLM conducts small timber sales to provide broadened oppor- y for small manufacturing concerns as well as large ones. This y also results in increased competitive bidding and larger timber eceipts.

ginning in 1952, the 18 O&C counties voluntarily agreed to con- te up to one-third of their share of O&C receipts for an expanded s road construction program. Through fiscal year 1960, $32,- 35 has been appropriated for construction and purchase of per- nt, heavy-duty mainline roads, suitable for year-round log portation. Through the end of the 1960 fiscal year, 185.7 miles ainline access roads have been completed, and 34 high-standard es constructed. Projects under construction include 112.1 miles ads and 15 bridges.

### *ase and Insect Protection*

hile fire is a spectacular enemy of forests, there are other enemies are constantly taking an enormous toll of timber—insects, dis- and windstorm.

LM foresters are constantly on the alert to detect any signs of at- by these destructive agents, and cooperate with Federal, State, private land owners and managers in investigations and control ures.

ith extensive acreages of white pine forests located in southwest- Oregon, including a smaller acreage in northern Idaho, BLM ates a blister rust control program to protect these valuable for- from the ravages of the white pine blister rust, a fungus disease.

LM has now worked 87 percent of its control acreage for the first and has 55 percent of its areas on a maintenance basis.

veral small groups of rust-resistant sugar pine trees of seedbear- size have been identified. In cooperation with forest geneticists, seed cones of these trees are being pollinated with pollen from r rust-resistant pines. The purpose is to produce a rust-resistant n of sugar pine which ultimately may be usable for the reforesta- of lands best suited for the growing of sugar pine forests.

## *Range Management*

Progress in the administration of grazing was made durin e year with emphasis placed on reducing overuse and continued co c- tive treatment.

Under provisions of the Taylor Grazing Act of 1934, BLM i re- sponsible for the administration and conservation of approxim y 436 million acres of federally owned range lands. About 140 mi n acres are within 59 established grazing districts. The lands ou de grazing districts are known as section 15 lands, after that sectic f the Taylor Grazing Act under which they are managed. In addi n, the Bureau handles grazing on about 1¼ million acres of public main lands in Alaska.

### *New Rules Speed Conservation*

To hasten the restoration and rehabilitation of public range l s new rules will speed up conservation efforts on rundown public ra e lands. In the past, some ranchers have “bought” the time neces to make orderly range-use adjustments by filing costly and time- suming appeals, first to the Director and then to the Secretary. S appeals have slowed down the rebuilding of the range and retar t needed range-use adjustments. Orderly schedules for range use replace this delaying process.

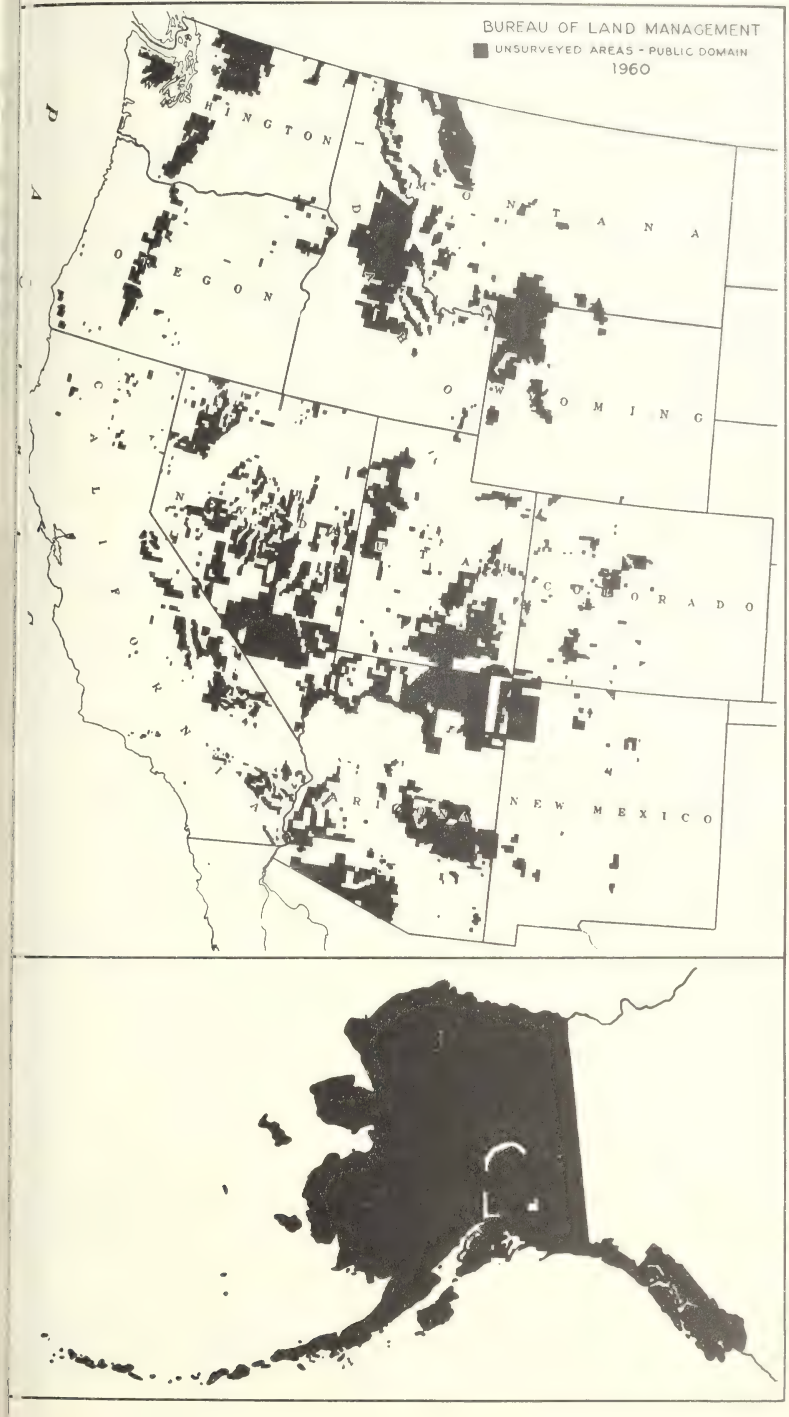
Adjustments in livestock licensed to use the range are necess when a range study demonstrates the range is overobligated and teriorating. Licensed use must then be reduced to the level the av able forage will support.

The new amendments to the Federal Range Code for Grazing D tricts will permit the Bureau to spread grazing adjustments of 15 pe cent or more over 2 or 3 years in special cases and begin the job rehabilitating the range immediately. At the same time the affec users can acquire additional sources of forage, make any necess livestock disposals, or complete other operational adjustments.

The new rules do not affect BLM's assigned responsibility to ca forward its range program on an immediate, across-the-board bas when circumstances demand fast action. BLM district managers m in cases of emergency, put any range-use adjustments in full force any time.

### *Farm Tenant Lands*

An order added about 1,807,000 acres of land utilization (LU) pr ect lands to four Montana grazing districts, and 239,000 acres to t


BUREAU OF LAND MANAGEMENT
■ UNSURVEYED AREAS - PUBLIC DOMAIN
1960
WASHINGTON
OREGON
CALIFORNIA
NEVADA
IDAHO
MONTANA
WYOMING
UTAH
COLORADO
ARIZONA
NEW MEXICO

New Mexico grazing districts. The transfer of the LU lands sir fies administration of the areas and facilitates range management conservation projects on these lands, which are intermingled with adjacent to other grazing district lands.

The LU lands were part of several million acres purchased b Federal Government during the 1930's under the Bankhead-J Farm Tenant Act.

Other new regulations will enforce a recent law (Public Law banning the use of airplanes and motor vehicles in roundups of a doned and stray horses and burros on public lands.

The legislation was passed after many people voiced concern a the use of airplanes and vehicles for roundup purposes as cruel inhumane. Until the new law was passed only State laws ap Now Federal law and regulations apply to Federal lands.

## *Grazing Fee Study*

An interdepartmental study on grazing fees was initiated d 1960 following a recommendation by the Comptroller General t study be undertaken. At the suggestion of the Chairman o House Committee on Interior and Insular Affairs, the joint-gr fee study is underway to arrive at a uniform basis for fees c federally owned grazing lands and to eliminate any inconsistenc the fees charged by Federal agencies.

The grazing fee charged under section 3 of the Taylor Grazin for 1960 was 22 cents per animal unit month of forage, the sa that charged in 1959. The fee is based on livestock prices in the as reported by the Department of Agriculture. A change in f made only when prices go up or down at least 2 cents the prec year. Twenty-five percent of the fee is used for range improve

Grazing lease rentals on lands outside grazing districts (secti lands) are on a sliding scale based upon the grazing capacity c lands. Annual rates range from 2 mills to 88 cents per acre.

BLM grazing receipts (including lands both inside and o grazing districts) during 1960 amounted to $3,487,992.

Another study of great importance was begun during the y analyze BLM's range inventory methods. The analysis will ir methods of mapping range features, vegetation and soil condi potential range improvements, wildlife factors, and proper gr use determination.

In cooperation with the Intermountain Forest and Range E ment Station, BLM has undertaken a study of cheatgrass to dete the best livestock grazing methods to use on millions of acres of e lands where cheatgrass is found. The study area is near Ham- , Idaho, but the results of the study will be important to other tgrass ranges in Oregon, Nevada, and Utah.

### *ction of Wildlife Representatives*

Bureau policy was established on the appointment of wildlife esentatives to grazing district advisory boards. Nonprofit wild- groups or organizations will now select candidates. Names of idates will be referred to the State fish and game department for oval and then to the BLM State Supervisor for consideration formal appointment.

ppointments will require further approval of the BLM Area inistrator if the candidate is an employee of the State fish and e department or the Department of the Interior's Bureau of Sport eries and Wildlife.

### *dition of Livestock and Trend in Numbers*

rmitted use of grazing district lands showed a slight increase in . In local areas, however, the animal unit months (a.u.m.'s) azing use was less than normal due to drouth. Range conditions ted in authorized nonuse of 1,083,835 animal units involving ,895 animal unit months.

Alaska beef and wool production increased sharply. Alaska had ncrease of 9,072 a.u.m.'s use in 1960 and an overall increase of 3 a.u.m.'s since 1956.

censes and permits were issued in 1960 to 18,976 livestock opera- to graze 8,506,398 livestock in the 59 grazing districts, totaling 3,017 animal unit months of grazing use. Approximately ,000 big game animals obtained more than 1,569,000 a.u.m.'s of ge from grazing district lands.

n section 15 lands, 9,848 leases were issued to 8,883 livestock ators to graze 2,343,780 livestock. Sixty-three grazing leases in ka covered 1,233,197 acres.

### *ge Adjudication*

e adjudication of grazing privileges and apportionment of the ral range is an important task in grazing administration and be done before issuing or reissuing licenses and permits. The shows the progress made in range adjudication last year.

*Annual progress report on range adjudication, Bureau of Land Managemen*

| State | Operators | Acres | Units | Forage inventory completed on— | | Dependent property surveys completed on— | | Adjud com |
|---|---|---|---|---|---|---|---|---|
| | | | | Acres | Units | Operators | Units | Opera tors |
| California | 367 | 5, 543, 279 | 14 | 1, 826, 705 | 8 | 221 | 9 | 15 |
| Oregon | 1, 129 | 13, 694, 834 | 454 | 5, 350, 056 | 42 | 342 | 56 | 20 |
| Total, area 1 | 1, 496 | 19 238, 113 | 468 | 7, 176, 761 | 50 | 563 | 65 | 36 |
| Arizona | 542 | 12, 477, 693 | 660 | 6, 689, 665 | 564 | 542 | 660 | [1] 54 |
| Idaho | 2, 634 | 12, 860, 795 | 165 | 7, 041, 984 | 103 | 840 | 73 | 95 |
| Nevada | 1, 141 | 47, 950, 582 | 155 | 30, 688, 298 | 88 | 845 | 108 | 59 |
| Utah | 2, 960 | 25, 008, 923 | 152 | 14, 507, 494 | 76 | 2, 836 | 152 | 86 |
| Total, area 2 | 7, 277 | 98, 297, 993 | 1, 132 | 58, 927, 441 | 831 | 5, 063 | 993 | 2. 95 |
| Colorado | 1, 704 | 8, 020, 799 | 86 | 4, 972, 358 | 66 | 1, 619 | 86 | 1, 30 |
| Montana | 3, 116 | 7, 804, 930 | 68 | 6, 173, 436 | 32 | 1, 748 | 35 | 1, 65 |
| New Mexico | 4, 127 | 13, 951, 124 | ------ | 12, 243, 775 | ------ | 1, 674 | ------ | [1] 4, 12 |
| Wyoming | 1, 242 | 13, 816, 288 | 32 | 4, 832, 682 | 18 | 856 | 32 | 71 |
| Total, area 3 | 10, 189 | 43, 593, 141 | 186 | 28, 222, 251 | 116 | 5, 897 | 153 | 7. 80 |

[1] In Arizona and New Mexico adjudication is completed and Federal range divided into individu ments.

## *Range Use Supervision*

Trespass use by licensees continues to be a major problem in r use supervision. Penalties imposed by State law are ofte adequate to discourage the habitual grazing trespasser.

Supervision has been materially aided by the establishment dividual and group allotments and by perfecting range-line ments to minimize conflicts in range use. Efforts to make actu counts of livestock has noticeably reduced this type of tresp

## *Range Conservation and Improvement*

Along with grazing management BLM is pressing forward gram of soil and moisture conservation authorized by the Na Soil Conservation Act of 1935. The Bureau's watershed prot and rehabilitation program is carried out on community water with the active participation of range users. Land-treatment tices are growing as livestock operators become aware of the be of seeding, brush control, pitting and furrowing, and deep ti

Accomplishments during the year include: Brush control, acres; pitting and furrowing, 10,068 acres; deep tillage, 10,087 pest control, 320,151 acres. The Bureau seeded about 140,000 of public range land during the fiscal year. In some areas, f quantity on successfully seeded areas has increased as much times.

ıe Bureau has seeded 2½ million acres of public range lands since . In addition, brush plants of little or no forage value have eradicated or reduced on 1½ million acres. However, more than illion acres still need conservation treatment.

rthfill detention dams, diversion dams, dikes, and water-spreading ms are being built to halt serious gully erosion where land treat- measures cannot do the job. During the year, the bureau 828 reservoirs, 196 springs, 106 wells, 55 diversion dams and 44 ıtion dams. Detention dams control gully formation and reg- floodflows. In addition, they provide permanent water for live-, waterfowl, and wildlife. More than 57,000 additional struc- and land-treatment practices are included in the Bureau's -range inventory of conservation needs. This year's construction 826 miles of range fences increased the Bureau's cumulative total ,000 miles.

emergency BLM flood control and rehabilitation program on acres near Deadwood, S. Dak., averted serious flood damage. A n September 1959 had stripped the land of vegetation. Treat- consisted of felling timber on the contour, seeding by helicopter constructing debris basins in the City Creek drainage. Seeding done under ideal conditions, and with normal moisture a satis- ry vegetative cover should result.

### d Control

ntrol and eradication of poisonous and noxious weeds is an im- ınt part of rangeland management. In 8 years 600,000 acres of eland have been seeded to perennial grasses capable of competing undesirable weeds and plants. Brush eradication to liberate ınial grasses has been completed on another 80,000 acres. About 00 acres have been chemically treated to control halogeton and poisonous weeds such as locoweed and larkspur.

combat infestations of the beet leafhopper, approximately 88,000 have been seeded and fenced. Medusa-head rye, an extreme fire rd, has invaded large areas in California, Oregon, and Idaho, ing the grazing capacity of the infested range from 40 to 75 nt. Cooperative research studies to find new methods to control weed are underway.

### ge Condition and Trend

mprehensive field surveys of range condition have been conducted nuously for the past 5 years in BLM's 59 grazing districts. At lose of the calendar year, these studies and surveys have covered about 93 percent of approximately 152 million acres of usable Fe range.

Four and one-half percent of the gross acreage of all distric considered to be waste or unusable for grazing by either livesto big game. The most striking accomplishment is the reversa downward-trend percentage to an increase in percentage of s condition by more than half, and the definite improvement by a one-fourth of the total acreage. This was accomplished with tinued grazing use, supplemented by conservation practices to up the productivity of the lands.

## *Recreation and Access to Public Lands*

Bureau of Land Management offices throughout the West are ta the initiative in working out agreements with private landowne assure access routes for sportsmen and others to large blocks o public domain. The agreements are being worked out concu with a study of present access routes and recreation areas as pa a concerted effort by the Bureau to help meet the growing recre needs of America's citizens.

The Taylor Grazing Act, under which BLM manages some million acres in 10 western States, specifically provides that the will be open to the public for hunting, fishing, camping, and lawful purposes. In some instances access to large blocks of p lands has been cut off by surrounding private lands.

To meet the growing needs of the public and to provide the for working out acceptable solutions to problem areas, BLM is a formal access policy statement during the year reinforcing language of the Taylor Act and pointing the way to various ans to specific situations.

BLM will concentrate on providing access to large blocks of p domain. There are many small or isolated tracts surrounde private lands which have little recreation value or potential. S tions to access routes may involve land or use exchanges, right-of agreements, and, if necessary, legal action.

In addition, the Department has proposed regulations requi the posting of signs on fences that cross public lands to infor public that the lands are open and directing them to access ro

The extent and diversity of interest in the proposed regula resulted in informal meetings in Oregon, Idaho, Utah, New Me Arizona, Wyoming and Colorado. The meetings improved p understanding of the proposed regulations and will assist the De ment in developing the rules in final form.

## *Fire Protection*

ire destroys. It destroys forests, range grasses, watersheds, tun-
, and wildlife habitats. It destroys tens of millions of dollars
th of natural resources.

he resource base available tomorrow depends to a considerable
nt on the success of fire prevention and fire control today. One
he most important responsibilities of the Bureau of Land Manage-
it is fire protection and suppression on 225 million acres in Alaska
about 150 million in other States, most of which is in the West.

he fire situation in the western States was critical in 1960, es-
ally in Idaho, Nevada, Utah, and Arizona. During the 1959
season 1,122 fires burned 876,887 acres, of which 586,535 acres were
laska. There were 612 lightning fires on Bureau lands, compared
39 last year. Man-caused fires totaled 510, a considerable reduc-
over the 820 in 1958.

xtra-period fires numbered 210. These fires (those that burned
ontrolled more than one day) were inaccessible and hundreds of
s from fire bases. Sometimes a whole rash of fires flared up at
time which overtaxed available facilities and manpower. Of
e, 73 burned more than 1,000 acres each.

he destructive forces of fire took severe toll in the Boise, Idaho,
ershed in August 1959. Flames devoured virtually every ounce
vegetative cover and organic matter on the steep slopes of the
north of town. Over 10,000 acres of valuable watershed were
royed, including about 3,000 acres of BLM lands. A few weeks
r the fire, heavy rains poured down the steep denuded hillsides
ying a deluge of mud, rocks, and debris into the city. Three
of muck, boulders, and flood silt were strewn over nearby residen-
property and cropland.

mergency action was necessary. Funds were diverted from other
ects to carry out the vitally needed flood control. The Bureau
restoration work on 1,800 acres of public domain lands. Contour
ches, partitioned by check dams every 20 to 30 feet were con-
cted on 617 acres. Contour furrowing was completed on 134
s. About 200 acres were drilled with perennial grass and bitter-
h. Siberian and crested wheatgrass were drilled on 1,050 acres,
le the remaining area was broadcast seeded. Losses from the fire
floods, coupled with rehabilitation costs added up to over $1½
ion.

### *hting Fire in Alaska*

Alaska there are an estimated 40 million acres of commercial
er, 85 million acres of woodland, and over 100 million acres of

range and tundra protected by BLM's firefighting organizati These lands are important for timber, for game range, for recreati and for mineral development.

Alaska has a 5- to 6-month fire season with long daylight hours, l humidity, little rainfall, high temperatures, and 30 to 60 days of he lightning storms which sweep across the center of the Alaska l mass. Lightning fires usually break out in areas that can only reached by air. Such fires, if not controlled soon after they start, m burn over areas equal to the area of Rhode Island or Delaware.

During the past 3 years, helicopters and specialized planes i cluding those converted to drop fire retardants, large capacity ca drops, along with high speed reconnaissance aircraft and smo jumpers have been successfully used. BLM set up a 15-man smo jumper installation in Fairbanks in 1959, which in 1960 fought fires at an average distance of 210 miles from the base of operati No smokejumper fires went uncontrolled. Continuation and exp sion of this unit is planned for the years ahead.

BLM's Alaska fire control program entered its first phase of panded development in fiscal year 1960, and by the end of the fis year funds were already assured to begin the second phase. Ph three will go into effect in another year.

## *Better Tools to Fight Fires*

Accomplishments in fire control made during the fire season i cluded strengthening BLM's detection and communication syst and refining the fire-danger rating system. Borate mixing, stor and loading facilities were established at Anchorage and Fairba Alaska; Boise, Idaho; and Baker, Oreg. Bentonite slurry is be tested to determine how well it works compared to borate. Fire vention was stressed through public education programs. To preve man-caused fires, BLM sought strict law enforcement and cl supervision of controlled burning. When necessary, high fire-dan areas were closed to the public.

Fire weather data was studied to determine daily fire-danger rat and burning indexes. Thirty-two fire training schools were held f BLM personnel before the fire season, and grazing districts condu many training sessions for temporary and emergency presuppres employees.

Fire protection on some BLM land in California, Oregon, W ington, Idaho, Montana, New Mexico, and Minnesota is handled contracts with other Federal, State, or local agencies. On la under contract protection 245 fires destroyed 42,803 acres in calen year 1959. Contract fire protection cost $996,034 for 6,614,383 a in fiscal year 1960.

Iigh temperature, low humidity, and dry vegetation created a ous fire hazard over many range and forest areas of the West at end of the fiscal year.

'ire control involves two appropriations. The one for presuppres-ı operations must take care of all the costs necessary to acquire and ntain BLM's firefighting equipment, supplies, buildings, aircraft, l so forth. It pays for training crews and pays their salaries while ı are not actually at fires. It also pays for all of the fire-protection tracts. The other fire appropriation covers the actual cost of fire pression.

'he BLM appropriation for presuppression during fiscal year 1960 $891,000, of which, $637,000 covered costs in Alaska. Fire sup-ssion costs during fiscal year 1960 totaled $2,950,617, of which 79,074 was spent fighting fires in Alaska. Fire protection and pression costs money. But it is a small price to invest in pre-ing priceless natural resources.

## *Eastern States*

'he remaining scattered public domain lands in Alabama, Arkansas, rida, Louisiana, Mississippi, Michigan, Wisconsin, and Minnesota administered by the Eastern States Office. Under its program the ı of public domain lands in the East is rapidly diminishing, as ds are transferred out of Federal ownership to States, local govern-ıts, organizations, and individuals.

n 1960 the Eastern States Office transferred title to 6,275 acres of lic domain lands to non-Federal ownerships. 1,640 acres were sold ublic auction, in addition to 3,787 acres transferred to individuals er the Color-of-Title Act. Seventy-seven acres were transferred States and counties and local groups under the Recreation and lic Purposes Act in addition to 340 acres under State grants and emnity selections.

s the remaining public lands in the East are reduced through ect sales the transfer of title to those tracts remaining becomes in-ısingly difficult due to conflicting claims of ownership.

number of valuable tracts, suitable for recreational and public poses use because of beach, river, or highway frontage, which have ı made available to the States, counties, and community groups, still under BLM administration. This is due in part to inability he qualified organizations to raise the required purchase and de-pment funds. Under the Bureau's recreational policy the Eastern tes Office may have a continuing responsibility for the areas. In rida there are 12 such tracts totaling 315 acres.

*Electronic surveying has replaced the miles of weary walking to measure dista*
*Deep in Colorado's Glen Canyon this surveyor will move by helicopter to his*
*station.*

Receipts from land sales amounted to $123,491, and receipts f noncompetitive mineral leases and permits on public domain acquired lands amounted to $4,905,797. The total amount receive 1960 from mineral leasing and permits (including competitive ing), was $13,927.

The new field office established in St. Paul, Minn., is providing cl cooperation with the State, quicker action on several large excha and selections in Minnesota and increased public lands and ti sales.

The Minnesota Department of Conservation plans to request thorization of the necessary funds to purchase some 33,000 acre so-called Volstead Act lands under the act of May 1, 1958. Excep several pending State exchanges and Recreation Act applicatio Michigan and Wisconsin, unreserved public lands in these two St have been almost entirely transferred out of Federal ownership.

Cadastral surveys were conducted in the States of Alabama, Flo Michigan, Minnesota, Mississippi and Wisconsin. These surveys of islands and of public lands omitted through error in the orig work, together with resurveys of isolated public land tracts.

ial surveys were of the equivalent of 18,000 acres of original veys.

n inventory of unsurveyed islands in these same States has been lertaken looking toward a systematic survey of part of the islands n year.

## *Outer Continental Shelf*

uring fiscal year 1960 the Bureau conducted three lease bid open- s for submerged lands off the coast of Louisiana and Texas. These s resulted in 167 leases totaling 745,853 acres with cash bonus bids unting to $370,752,186.

n February 1960 the sixth and largest Federal competitive oil and lease bid opening ever held resulted in high bonus bids of more n $282 million for 145 tracts of Outer Continental Shelf lands Texas and Louisiana. The leasing involved the largest number racts ever offered and the largest total of bonus bids ever re- ed in a single bid opening. Counting unsuccessful bids, the leasing olved over $567 million of private capital seeking oil lease de- pment opportunities in the oil-rich Outer Continental Shelf.

ractically all of the major oil and gas development companies ticipated in the lease bidding. Bidders included 41 separate com- ies and individuals. A total of 444 bids was received, distributed ng 173 tracts. The highest single bid was $11,112,000 for a 5,000- tract. Three other tracts each received bids of over $10 million.

n June 30 there were 526 Outer Continental Shelf leases embracing 6,349 acres with collections from rentals totaling $2,509,299. tals on 24 pipeline rights-of-way were $2,405.

## *International Cooperation*

orld events emphasized the importance and urgency for dealing n land problems particularly in those agrarian countries where natural resource base is still undeveloped. Agencies special- g in international activities made continual and increasing requests the services of BLM involving resource management and conser- on programs, and the application of land and mineral laws in administration of the overall Bureau program.

continuous exchange of ideas occurred between BLM personnel officials of essentially all free world countries on subjects involv- resource settlement, development, and management. Technical port was provided in the activities of cadastral survey, land rec- s systems, land-use classification, land distribution, mineral leasing, range and forestry conservation and management.

All requests were fulfilled covering the assignment of BLM te nicians to assist other countries. The facilities of the Bureau w utilized by 60 representatives of other countries who observed a studied actual operations of the various Bureau programs.

## *Appeals*

Anyone who has been adversely affected by a decision issued b field officer of the Bureau of Land Management has a right of app to the Director. This right entitles the aggrieved party to have case reviewed by filing an appeal in accordance with the Departme regulations.

During the year 3,677 new appeals to the Director were recei which with 2,491 appeals on hand at the beginning of the year, tota 6,168. A total of 3,495 appeals were decided by 1,351 separate cisions. In addition, 2,802 letters and memorandums were prepa relating to appeals. There were 2,673 appeals remaining on han the close of the fiscal year.

Of the 3,495 appeals decided during the year, 852 were cove by 27 separate decisions approved by the Department prior to p mulgation. These decisions involved desert land and small tract plications prompted by promotional activities of land locators oil and gas lease offers that had not been filed in good faith but clou the titles of existing oil and gas leases. A Bureau decision wh is issued with departmental approval constitutes the final decision the Department.

## *Hearings*

Bureau hearing examiners received 505 proceedings for adjudicat hearings in 1960. Examiners began the year with a carryover of proceedings. The new cases involved 1,856 claims, entries, leases, and included 64 proceedings under Public Law 167, involving mining claims; and 267 other contests involving 685 mining clai They also included 3 contests to cancel 471 mineral leases and grazing appeals involving 187 permittees and licensees.

During 1960 hearings were held in 219 land and minerals proce ings and 41 grazing proceedings involving 96 permittees or licens Examiners closed 353 proceedings on their dockets, 201 by decisi after a hearing and 152 on procedural grounds without a heari Unclosed proceedings at the end of the year numbered 447. Of th 124 involved grazing and 323 dealt with land and minerals ca

In 1960 there was a 54-percent increase in cases referred to exam

, a 33-percent increase in cases heard, and a 19-percent increase cases closed. Grazing cases increased approximately 10 percent. t most of the increase involved mining claims.

## *Records Improvement*

The Records Improvement project is responsible for a program create a modern system to show the title, use, and availability of blic lands and resources administered by the Bureau of Land nagement. The contract for new Arizona status records was com- nced during fiscal year 1959 and was completed on June 10, 1960, a cost of $484,490.

The first new land records project handled by BLM's own employees s performed in Alaska. During the year new records were pre- red for 3,724 townships at a cost of about $407,000. The project l be completed early in fiscal year 1961.

n June work was begun on new records for Montana, a project ich will require about 2 years to complete.

## *Staffing*

As of June 30, 1960, there were 2,490 permanent and 793 seasonal ployees on the rolls of the entire Bureau. These totals were dis- buted as follows: Area 1 (Washington, Oregon, California), 747 manent and 193 seasonal; area 2 (Idaho, Nevada, Utah, Arizona), permanent and 285 seasonal; area 3 (Montana, Wyoming, Colo- lo, New Mexico), 579 permanent and 145 seasonal; area 4 (Alaska), permanent and 118 seasonal; and Eastern States Office and Direc- 's Office (Washington, D.C.), 345 permanent and 52 seasonal.

## *Finance*

Total appropriations (including supplemental appropriations) dur- fiscal year 1960 for the Bureau's management operations amounted $27,817,000; for construction, $5,168,135; and $768,653 for range provements.

The work of the Bureau is financed by the Management of Lands l Resources appropriation and is divided into 10 functional activi- representative of the Bureau's responsibilities. The suppression fires on BLM timber and grazing lands required a supplemental propriation of $2,450,000 in 1960.

The Bureau's construction activity includes access roads to timber ources (principally on the O&C forest lands of western Oregon) and fire protection facilities in Alaska. Out of all funds used construction, some $5 million was voluntarily contributed last by the 18 western Oregon forest-land counties from funds which would otherwise have received as part of their share of timber receipts. In addition, the counties made available funds for forestation and access road maintenance.

Funds for range improvements are made available by Congres a percentage of the fees charged public land range users. This mo is returned to the grazing districts to help pay for needed fen watering facilities, cattle guards, and other improvements.

### *Receipts*

Gross receipts from the sale and management of public lands resources during fiscal year 1960 totaled $371,067,867. This tota the highest amount ever received in a single year and was more t double the amount of revenues taken in a year ago. The rece came from the following sources: Mineral leases and permits $3 018,288 (including $229,456,819 from rents, royalties, and bonuses the Outer Continental Shelf); timber sales, $36,359,337; sales public lands, $5,101,297; grazing, $3,487,992; fees and commiss $1,798,817; rights-of-way $169,263; and $132,873 from all ot sources.

### *Distribution of Receipts*

Bureau of Land Management receipts for fiscal year 1960 w distributed as follows: $51,841,376 to 26 public land States (of wh $16,258,579 went to the 18 western Oregon timber land counti $51,576,949 was deposited to the Reclamation Fund; $263,320,382 w into the General Fund of the U.S. Treasury; $3,104,522 was tra ferred to other Government agencies; $361,568 was earmarked f Indian trust funds; and $863,070 was returned to the grazing distr where it will be available in 1961 for range improvements.

### *Total Receipts Exceed $2 Billion*

All time receipts of the Bureau of Land Management since 1 have now totaled more than $2,263,700,000 not counting about $ million additional Federal revenues in temporary escrow, pend final solution of the Outer Continental Shelf boundary dispute. Si 1946, receipts have now exceeded $1.5 billion.

# tional Park Service

rad L. Wirth, *Director*

E YEAR ENDING JUNE 30, 1956, was a notable one for the
onal Park Service. An exceptional record of accomplishments
made in new and improved facilities and services in the parks and
uments, with new areas added to the System, an increase in the
essional staff in the field, and wide public approval for the Mission
ogram.

t the biannual conference of the Service in Williamsburg, Virginia,
ecember 1959, an event of transcendent importance to the National
Service was the receipt of a directive from Secretary of the
rior Fred A. Seaton.

e Secretary lauded the achievements of the National Park Serv-
n its Mission 66 program—designed to meet the needs of increasing
ation in the National Parks and the pressures of a population
losion" on our natural resources—and added: "Because of the sit-
on which America confronts in this respect, I ask * * * the Na-
l Park Service to give high priority to a program of studying and
tifying areas which should be preserved for the enjoyment and
iration of all the people * * * These should include seashores,
ic mountain areas, prairie grasslands, places of national import-
in our history, and other nationally significant * * * areas."

cretary Seaton's directions included: development of a plan for a
em of reserve areas from which future generations may draw for
ed parks and recreation areas; the establishments of new parks,
uments, recreation areas, and historic sites to complete the Na-
l Park System and meet the growing need for such areas at the
onal level; put into effect programs for the most efficient use of
Service organization, and training and career development of its
onnel; encourage and assist in the establishment and development
tate park systems, and other public lands recreational opportuni-

ties; keep clearly in view the importance of preserving true wilder areas in the System for future generations; and to keep uppermos mind the directive of the Congress when establishing the Natio Park Service in 1916: "to conserve the scenery and the natural a historic objects and the wildlife therein and to provide for the enj ment of the same in such manner and by such means as will le them unimpaired for the enjoyment of future generations."

The Mission 66 program—now in its fifth year—was launched July 1, 1956, for the purpose of staffing and equipping the Natio Park System to care for an estimated 80 million visitors in 196 the year the National Park Service will celebrate the 50th annivers of its establishment.

The year again showed an increase in total public visits to parks and monuments, from 60,554,000 in fiscal 1959 to 65,959,00 1960. This follows the trend of previous years and necessita stepped up planning for further renovation, conservation and ad tional facilities to meet the demands of coming years.

During the year the National Park Service began evaluating accomplishments and experiences of the Mission 66 program to d and measuring them against the overall goals. The Service vi put the resultant new ideas and thoughts into workable plans wh will be a guide in revamping the Mission 66 program, profiting fr lessons of the past and geared to anticipated needs.

Hence, Mission 66 began a study to determine what would ha to be accomplished in addition to its original program to attain objectives set for 1966, and to fulfill the purpose for which the N tional Park Service was established in 1916: "to conserve the scen and the natural and historic objects and the wildlife * * * and t provide for the enjoyment of the same in such manner and by su means as will leave them unimpaired for the enjoyment of futu generations."

The Mission 66 program is not only concerned with the large-sc development of new and improved visitor facilities, the reconstr tion of roads and trails, and the laying out of campgrounds, equally emphasizes the preservation of the great wilderness areas i the National Parks and Monuments—America's priceless heritage

During the 12-month period, 1,252 active projects were under co struction involving an investment of approximately $105,237, including new and improved campsites and visitor centers. Duri this period 528 projects representing an investment of abo $38,000,000 were completed and opened for public use.

Since Mission 66 was launched, 3,357 construction projects invo ing an investment of $213,000,000 have been completed or are unc construction. In addition, private capital invested some $20,000,

the construction of public accommodations and related service
ities.

mping increased and continued to tax facilities. Of 4,829,000
rded camper-days, 11 percent were spent under conditions in
ss to the capacity of the parks' campgrounds. The trend in trailer-
ping also showed an upward curve with more than one in five
per-days spent in trailers.

manage the enlarged operations and extended activities in the
em, and to meet the need resulting from the greatly increasing
ber of visitors, additional employees were hired and trained to
nent the park and monument personnel which at the end of the
l year totaled 4778 permanent employees, while during the height
the visitor-season another 3724 seasonal employees were on the
of the National Park Service.

ajor road projects placed under contract during the year totaled
1,413, which involved 108 miles of reconstructed roads. A total
3 miles of reconstructed park routes were completed at a cost
,883,900.

he legislative phase of the National Park Service's program is an
important one. Under the guidance of the Administration and the
artment, the Service obtained gratifying results in the form of
ressional action throughout the year.

gislation was enacted authorizing the establishment of three new
s. The events relating to the beginning of the American Revolu-
are to be preserved at Minute Man National Historical Park,
sachusetts. Bent's Old Fort in Colorado, a fort and trading post
ortant in the opening of the west, is authorized to be made a na-
al historic site. The Civil War battle which climaxed the cam-
n to keep Missouri in the Union will be commemorated through the
blishment of Wilsons Creek Battlefield National Park.

ighly important is the enactment of law by which there may be
oved the threat of adverse developments at the Antietam Na-
al Battlefield Site, Maryland. Authority was granted to acquire
acres of land and to further preserve the historic scene by obtain-
covenants, restrictions, or easements on an additional 1017 acres.

uch needed authority was provided to carry out the Mission 66
gram for Mount Rainier National Park, which involves moving
headquarters from Longmire to Ashford, Washington, outside the
.

portant boundary legislation was enacted for Zion National
k, Utah; Custis-Lee Mansion, Virginia; Fort Laramie National
ument, Wyoming; and Stones River National Battlefield, Ten-
ee. In all 27 laws directly affecting the National Park Service
enacted in fiscal year 1960.

In addition to legislation affecting areas of the National P System, Congress enacted Public Law 86–523 which reiterates strengthens the Federal government's policy for the preserva of archeological and historical data which might otherwise be as the result of dam and reservoir construction.

Other measures still pending in Congress which are especi important are the proposals to establish national seashores, to cr the Chesapeake and Ohio Canal National Historical Park, to re the boundary and provide an entrance road to Dinosaur Natio Monument, and to acquire the Storer College property for addi to Harpers Ferry National Monument.

The National Survey of Historic Sites and Buildings, as a p of the Mission 66 program, showed considerable progress. Comple were the following studies: Prehistoric Hunters and Gather English Exploration and Settlement to 1700; Development of English Colonies 1700–1775; Political and Military Affairs, 17 1830; The Civil War, 1861–1865; as well as a number of subthe in Westward Expansion: The Cattlemens Empire; Military Indian Affairs; The Farming Frontier; the Texas Revolution War with Mexico; Overland Migrations West of the Mississip and two special studies—Fort De Soto, and Fort Union and Santa Fe Trail.

Largely on the basis of funds donated to the Service by the Soc of the Lees of Virginia and others, the Service was able to purch the Middleton Collection of Lee memorabilia, from the estate of late Mrs. Robert E. Lee, 3d. The collection, comprising over pieces of furniture, crested. silverware, glassware, chinaware, once belonging to General Robert E. Lee, will now be permanen preserved at the Custis-Lee Mansion National Memorial in Arling

To accomplish its program for archeological investigations Service areas and for salvage of archeological data in reservoir ar throughout the nation, the Service negotiated contracts with St and local institutions totalling $328,500. An additional $122, was transferred to the Smithsonian Institution for archeolog salvage work in the Missouri River Basin and in the Walter George reservoir (Ala.-Ga.).

## *Interpretation*

The interpretive program of the National Park Service provi additional educational services during the past year to the ev increasing number of visitors to the parks, monuments and ot areas.

Total visits to the units of the National Park System increas

58 million in 1958 to nearly 63 million during 1959. Under the ion 66 program, facilities for visitor comfort, information, in- etation as well as inspiration have increased and were substan- improved during the past several years and this trend continued ig the past year.

w visitor centers were added to the system and the museum ctions were enriched by accession of valuable objects, such as a ca of the 1902 glider used by Orville and Wilbur Wright at Hawk, N.C.

ecial events continued to emphasize the importance of the on's outstanding historic sites, an example of which was the first al raising of the 49-star flag at Fort McHenry National Monument Historic Shrine at Baltimore on July 4, 1959. Other important al events were the celebration incident to the acceptance of lands ea Ridge National Military Park and the celebration at Gettys- and Abraham Lincoln Birthplace in connection with the Lincoln uicentennial program.

## *ice to the Public*

e interpretive services program continued to offer park visitors and lecture services by skilled and experienced naturalists, rians, and archeologists—supplemented by new automatic audio- l presentations, museum exhibits, self-guiding trails, wayside its, and interpretive signs and markers.

is public service added not only to the park visitor's enjoyment rovided an understanding of the natural and historic environ- , which lead to important benefits—a greater appreciation of rvation concepts.

e earthquake in Yellowstone National Park and the eruption of uea Volcano in Hawaii National Park provided outstanding rtunities for vivid interpretation of geologic events which were utilized and which will play major roles in future interpretive rams of both national parks.

me 48 nonprofit scientific and historical societies contributed 96 for aid to the National Park Service in 1959 for research, rial and equipment and library purchases in its interpretive ram.

## *tor Centers*

sitor centers, constructed under Mission 66, are outstanding ures of the parks and monuments and contain much appreciated ities to help visitors obtain greater benefit and enjoyment from park visits.

*Geysers in Yellowstone National Park, an attractive feature to the ever-increa number of visitors to the park, reacted violently to the August 1959 earthqu and many changed their pattern of behavior.*

Nine more of these multiple-use buildings were opened to the pub during the fiscal year, including centers at Arches National Mo ment, Utah; Bryce Canyon National Park, Utah; George Washing Carver National Monument, Mo.; Grand Teton National Park, Wy Mammoth Cave National Park, Ky.; Montezuma Castle Natio Monument, Ariz.; Mound City Group National Monument, Oh Zion National Park, Utah; and National Capital Parks in Wa ington, D.C.

Story-telling exhibits were installed in 12 visitor centers and am these the exhibits for the Rock Creek Nature Center in Washingt D.C., had the additional feature of being designed particularly students and school children. This center also contains a planetari an assembly room and an exhibit room with "work-it-yourself" a living displays.

## *Roadside and Trailside Interpretation*

During the 1960 fiscal year, facilities to guide the visitor along roadsides and trailsides in many of the parks were expanded. Ro exhibits for the entire park were completed at Fredericksburg-sylvania National Military Park. Important new roadside or side exhibits were also completed on the Natchez Trace Parkway, ort Frederica National Monument, in Rocky Mountain National k, at Navajo National Monument, and in Olympic National Park. ew interpretive signs and markers were completed at Fort Fred- National Monument, Fredericksburg-Spotsylvania National ary Park, Abraham Lincoln National Historical Park, George hington Carver National Monument, Grand Teton National k, Scotts Bluff National Monument, Craters of the Moon National ument, Olympic National Park, and Isle Royale National Park.

## io Visual Planning and Installation

ie quality and number of audiovisual interpretive programs, sup-ienting personal services, advanced greatly during the fiscal year. use of professional script writers and narrators, coupled with oved electronic equipment and production techniques, resulted igher quality presentations.

illy automatic slide-sound equipment was installed in 15 visitor ers and 6 new amphitheaters, and 29 audio stations were placed peration. Loudspeakers were being replaced at audio stations aptioned slides and handphones, reducing the disturbance made he loudspeakers.

## eum Program

uring the year park staffs evaluated and catalogued more than 0 museum items, bringing the records up to date and allowing the sfer of items needed for display in new visitor centers.

quipment needed for the safe storage of museum specimens was hased for 62 parks. Of particular significance, specialists under- the restoration of the Gettysburg cyclorama and the ceiling mural he Senate Chamber in Congress Hall, Independence National orical Park.

ublic-spirited citizens donated museum items of considerable value, bly 16th century objects for Castillo de San Marcos and Fort oline, and objects closely associated with the Wright Brothers and rge Washington Carver.

he National Museum, the Air Force Museum, the Ohio State Mu- and other institutions generously lent or transferred museum s to museums of the National Park Service.

*Reenactments of America's historic events, like this one at Harpers Ferry Nati Monument, recall our Nation's glorious past and heighten the visitors' interest.*

## *Research*

Archeological, geological and historical research was contin throughout the fiscal year, among others, in the Virgin Islands Effigy Mounds, Iowa; Sequoia-Kings Canyon, Calif.; Death Valle Calif. and Nev.; Joshua Tree, Calif.; Harpers Ferry, W. Va., Md.; Jefferson Expansion National Memorial, Mo.; Independe Hall National Historical Park in Philadelphia, Pa.; Theodore Ro velt National Memorial Park, N. Dak.; and Wetherill Mesa in M Verde, Colo.

The National Park Service also carried on an extensive archeolog salvage program in 29 reservoir areas under cooperative agreeme with the Smithsonian Institution and 31 State and local instituti In the Missouri River basin, the Smithsonian Institution put f parties in the field. Surveys and excavations in the Glen Can and Navajo Reservoirs—now under construction in the Upper C rado River basin—were conducted by the University of Utah and

*ides caused by earthquakes in Yellowstone National Park in August, 1959,*
*ed extensive repairs to roads and buildings, amounting to several million*

ums of Northern Arizona and New Mexico. The University of
s carried on several projects in the Iron Bridge and Ferrells
ge Reservoirs in Texas.

logical research in corporation with the Department's Geological
ey involved studies in glaciology as well as geologic mapping in
er, Mount Rainier and Grand Canyon National Parks. In the
gical sciences, the Service continued the study of elk of Jackson
, Wyo., and the study of wolves and moose on Isle Royale in
igan. Ecological studies were conducted in California in Joshua
National Monument and in Death Valley National Monument a
on big horn sheep continued. Marine biology studies con-
d also at Everglades and Virgin Islands National Parks.

storical research was inaugurated at San Juan National Historic
nd architectural research in the Virgin Islands, while exhaustive
rch continued at Independence National Historical Park and at
ers Ferry National Monument.

## *Wildlife*

The mammals, birds, reptiles, amphibians and fishes in areas o e National Park System continue to be of prime visitor interest. e perpetuation of all native animals in their natural environme is a primary objective of the National Park Service and cooper te research by qualified institutions and individuals, such as the rese h on grizzly bears in Yellowstone National Park by the Montana S te University, is encouraged by the Service.

Management and interpretation of important fishery resourc of the parks continued, including the providing of accurate informa n on native fishes, and the establishment of self-guiding underw r trails in seashore environments.

## *Park Publications*

The phenomenal increase in family camping, recreational pur s, and education interests in the National Parks and other areas s demonstrated by the mounting demands for informational and ed tional literature.

The Service produced 11,650 copies of free informational pub i tions during the fiscal year, including new format folders for C r Lake and Glacier National Parks and nine smaller areas.

Two new historical handbooks—Antietam and Vanderbilt M sion—were added to the series, and one—The Lincoln Museum d The House Where Lincoln Died—was revised. One natural his y handbook—Great Smoky Mountains—was added to that series, d two in the archeological research series—Archeological Excavat s at Jamestown and The Hubbard Site and Other Tri-Wall Struct s in New Mexico and Colorado—were issued. The Service also duced the report entitled Recreation Today and Tomorrow in e Missouri River Basin, in cooperation with the Missouri Basin In Agency Committee.

The Public Inquiries Unit received 54,984 requests for informa n during the 1960 fiscal year, which total included 1,235 foreign requ s and 1,182 congressional requests.

A total of 295,715 informational publications was received du g the year and bulk distribution used in answer to requests rece d totaled 213,040, exclusive of sales publications and other miscellan s publications—such as concessioner publications.

During the year, the National Park Service increased its colle n of photographs to better illustrate Service publications and for i proved park representation in newspapers, magazines, encyclope i and textbooks.

survey of the demands on the National Park Service from writers, administrators, governments as well as private institutions in r countries, showed approximately 600 foreign inquiries in a n foreign languages received for information and technical tance.

ooperation with the Standard Oil Co. of California and the Sin- Oil Corp., in their respective programs of educational radio rams and instructive magazine advertisements, culminated in firms receiving the Department's Conservation Service Award nlightened public-service programs in the field of conservation. ic attention was also given to the 40th anniversary of the nature e service in the National Park System, begun in 1920 by Dr. and Charles M. Goethe. Dr. Goethe was also the recipient this year e Department's Conservation Service Award.

## *orical Commissions*

ne Civil War Centennial Commission continued its activity in aration for observance of the centennial years. Meetings were in Washington and in St. Louis.

ne Lincoln Sesquicentennial Commission was continued from ch 1 to June 30, 1960, to enable the Commission to complete its report to Congress.

ne Hudson-Champlain Celebration Commission observed the 350th versary of the explorations of Henry Hudson and Samuel de nplain.

ne Boston National Historic Sites Commission, created in 1955 udy historic objects, sites and buildings in Boston and vicinity ing to the Colonial and Revolutionary periods, extended its 2- study to June 30, 1960, at which time the final report of the mission was submitted and the Commission disbanded.

ne New York City National Shrines Advisory Board, established romote public cooperation in the rehabilitation, preservation, and lopment of Federal Hall National Memorial, Castle Clinton and ue of Liberty National Monuments in New York City, added new bers to the body in the spring of 1960—which undertook a re- d program to secure donated funds to complete the development ne areas by the opening date of the World's Fair in New York in .

ne protection and management of back country has become more cal with the growing interest in the primitive and undeveloped s of the parks. Studies are under way to determine the patterns e and provide guides for the future.

*A huge rockslide caused by earthquakes in August, 1959, resulted in several m dollars worth of damage to Yellowstone National Park, in Wyoming. Alth there were 17,000 people in the park at the time, no one was injured.*

The training of park rangers, foresters and supporting perso was extended to men in all areas in a variety of programs and sub tailored to fit the many situations encountered in the Service. E phasis was placed on safety, forest and structural fire control, r logical monitoring, search and rescue, law enforcement, and moun eering. The first water safety and rescue seminar was conduct Everglades National Park for 16 park rangers and 6 other Fe employees. The National Park Service Training Center at semite National Park completed its third successful year, gradua 50 new employees.

During 1959 the Service's system for generating and repor statistics on public use of the parks was overhauled. Statis methods are more rigorously controlled than heretofore. The system is designed to become a basic vehicle in developing data management and planning relating to park workloads, develop priorities, design loads, changes in public pressures and needs, identification of opportunities for new public services.

## Ranger Activities

he divisions in four regional offices have been staffed with division fs and good progress was made in improving assistance to the ks in the fields of preservation and protection.

major revision of title 36, Code of Federal Regulations, chapter as completed and a new edition of the Code was issued. This ates and modernizes the regulations in view of the changes in or use practices in recent years.

### untaineering

he mountainous parks are consistently attracting about 20,000 ons annually toward the rugged summits. It is a recreational et with heavy returns in satisfaction, but inherent hazards are ys present and 10 lives were claimed this year by those seeking he high and trackless places. The relatively infrequent accidents mostly of a dramatic nature and thus become widely known. The t, time and cost that goes into search, rescue or evacuation is ortionately great.

### of Water Areas

he vigorous upward trend in all boating and water activities opens areas of use and demands for protection services and facilities n increasingly greater level. This is creating a lag that must be come to meet obligations for visitor safety, enjoyment and preser- on of park features.

### elve Months of Service

1941, 40 percent of that year's 21 million park visits occurred in and August. In 1959, 21 million visits occurred in these 2 ths alone, but constituted only 34 percent of the year's total of nillion.

his means that parks now receive during nonpeak travel months three times the volume of travel that formerly occurred during peak period. The visitor pattern has shifted so the provision of ic services now approaches a year-long operation versus a seasonal

### est Fire Control

he fire control workload increased substantially this year. The seasons, particularly in the western mountain parks, extended

*The Hurricane Ridge Lodge in Olympic National Park, Wash., is a vantage giving a sweeping view of the forested Olympic Mountains.*

2 to 3 months beyond normal. The occurrence of 517 fires wa significant increase over the previous 5-year average of 368.

Man-caused fires increased 42 percent over the previous year, lightning-caused fires, 9 percent. However, the 3,061 acres of p vegetation burned was far less than the previous 5-year average 8,444 acres and the lowest since 1939. The safety record of no abling injuries during firefighting activities is outstanding.

Greater use was made of aircraft for scouting, detection, movem of suppression personnel and supplies, and application of fire tardants on burning fuels. Smoke Jumpers were utilized for first time in region four.

## *Forest Insect and Tree Disease Control*

Maintenance control operations kept most insect and tree disea and subsequent vegetative losses, low. Barkbeetle infestations mixed conifers in California increased sharply. Mountain p beetles have invaded the 60,000 acres of high mountain lodgepole p

*At e dedication of the Cumberland Gap National Historical Park, Department of th nterior Secretary Fred A. Seaton is shown points of interest by Superintendent M rd D. Guy.*

in osemite National Park which have been weakened by repeated at cks of needleminer. Both infestations were combated by direct co rol particularly in the public use areas.

cti-dione, an antibiotic, has proven effective in destroying white p blister rust infections on western white pine. Control programs in hite pine forests are being reoriented since it is now practical to e nd protection to infected western white pines not included in the o inal ribes eradication units.

## Wi dlife and Fish Management

ish management was oriented to retain natural wild fish populati s and to stress that fishing is an incidental park experience rather th a primary one. Mammoth Cave and Grand Canyon live-trapped de for transplants in Kentucky and the Navajo Indian Reservation. A ear management policy aimed at reducing personal injury to vi tors and returning the bears to natural habitats has been initiated.

## Recreation Resource Planning

he preparation of the National Park System plan, a program desi ned for selecting and preserving, while still available, qualified ou standing scenic, scientific and historic areas of the Nation so that

*Campsites, such as this one in Olympic National Park, Wash., are favorite vaca*
*spots to increasing number of visitors to the national parks.*

future park needs may be fulfilled, made significant progress dur
the year.

Fifty-eight areas received field investigation or were otherwise
ventoried for possible consideration for national park purposes.
addition, comprehensive studies were made of several areas to
termine their national significance and their feasibility and suitabil
for inclusion in the system. Among these are the Great Salt La
and Promontory Summit in Utah, Fort Davis in Texas, Fort Smith
Arkansas, Fort Larned in Kansas and Bent's Old Fort in Colorado

Legislation has been introduced in Congress to establish a F
Bowie National Historic Site, Ariz.; Hubbell Trading Post Natio
Historic Site, Ariz., and an Arkansas Post National Memorial
Arkansas. The Russell Cave National Monument, Ala., is expected
be established by Presidential proclamation when the lands have be
donated.

Other bills introduced in Congress would authorize comprehensi
field studies of areas considered to be suitable for national park i
clusion in the Northern Cascades region of Washington and Sawtoo
Mountain region of Idaho, both of which are now in national fores

## ndary Adjustments

gislation authorized addition of lands at Antietam National Bat-
ld Site, Edison Laboratory National Monument, Independence
onal Historical Park, Montezuma Castle National Monument,
Wright Brothers National Memorial; additions and deletions at
gs Mountain National Military Park and Zion National Park;
ange and addition of certain donated lands at the Everglades
onal Park; and transfer of a small portion of San Juan National
oric Site to the municipality of San Juan as a city park.

gislation also authorized boundary revisions and a change in
e for Fort Laramie National Historic Site and Stones River Na-
l Battlefield, while boundaries of Muir Woods, Black Canyon
ie Gunnison, Cabrillo and Colorado National Monuments were
ed by Presidential proclamation.

iblic land orders reserved administrative sites near Juneau and
g Salmon, Alaska, for Katmai, Sitka and Glacier Bay National
uments.

ie McGraw-Edison Co. donated Glenmont, Thomas A. Edison's
e in West Orange, N.J., for addition to Edison Laboratory Na-
l Monument. Mr. Wallace E. Pratt of Carlsbad, N. Mex., donated
acres of lands located in McKittrick Canyon, Tex., for a
hed area addition to Carlsbad Canyon National Park. The
ral Services Administration approved transfer of about 3,600
of land from the Atomic Energy Commission for addition to
lelier National Monument, as proposed by Presidential procla-
on.

lls introduced in Congress during the past fiscal year would
orize boundary adjustments at Castillo de San Marcos, Dinosaur,
oers Ferry, and Scotts Bluff National Monuments; Coronado Na-
l Memorial; Blue Ridge and Natchez Trace Parkways, and
npic and Shenandoah National Parks.

her bills would establish a portion of the Tucson Mountain Park
detached unit of Saguaro National Monument; authorize a
dary revision of the Fort Necessity National Battlefield Site;
itate certain land exchanges and adjustments pertinent to park
inistration at Vicksburg National Military Park; provide a new
quarters site for Mount Rainier National Park about 9 miles from
park, and a small addition to De Soto National Memorial.

## y Areas Proposed

ie Department recommended that the Congress authorize estab-
nent of three national seashores to be located at Cape Cod, Mass.,
re Island, Tex., and Oregon Dunes, Oreg. Studies have continued

*Carlsbad Caverns National Park, N. Mex., draws an ever-increasing numbe visitors who enjoy its subterranean spectacle as well as the lectures by national rangers.*

for the proposed Point Reyes National Seashore in California Cumberland Island, Ga.

A Park Service report recommending the establishment of an Oz Rivers National Monument in Missouri was issued during the y A Great Basin National Park proposal in Nevada was considere congressional hearings held in Nevada in December 1959. Prog was made in evaluating a Prairie National Park proposal in Kar and the Allagash River region in Maine. The Department suppor the Chesapeake and Ohio Canal National Historical Park prop in Maryland.

## *Areas Authorized or Established*

In accordance with authorizing legislation, notice of the establ ment of Grand Portage National Monument, Minn., effective Janu 27, 1960, was given by the Secretary. The Grand Portage Band Chippewa Indians and the Minnesota Chippewa tribe previously donated their trust lands within the monument boundaries to United States for the purposes of the monument.

nportant sites along the route traversed by the British military dition from Boston to Concord, Mass., at the opening of the War he American Revolution, were authorized to be established and erved as the Minute Man National Historical Park by the act of ember 21, 1959.

e Wilson Creek Battlefield near Springfield, Mo., site of a ggle between the Confederate and Union forces for control of State in the first year of the Civil War, was authorized to be lished as a national park by act of April 22, 1960. Establish- t of Bent's Old Fort in Colorado as a national historic site was orized by act of June 3, 1960.

rk status for these areas becomes effective when sufficient lands been acquired to warrant establishment.

e act of September 8, 1959 changed the designation of the ham Lincoln National Historical Park in Kentucky to the ham Lincoln Birthplace National Historic Site.

orseshoe Bend National Military Park was established by Presi- ial proclamation on August 14, 1959, pursuant to an act of gress of July 25, 1956. Lands were donated by the State of Ala- a and the Alabama Power Co.

## *ionwide Recreation Planning*

ventory of potential recreation areas and studies leading toward letermination of outdoor recreation needs received major emphasis e continuing work on nationwide planning for nonurban recrea- resources.

addition, efforts were made toward completion of the inventory xisting recreation areas and supplementing inventory data pre- sly collected. Data collected on existing areas were assembled for Outdoor Recreation Resources Review Commission, as was a ral evaluation of recreation opportunities and developments in ted metropolitan areas and counties throughout the country.

## *eline Surveys*

ndings from the 2-year recreation area survey of the Great Lakes eline were released in a two-volume report issued by the National Service, Our Fourth Shore and Remaining Shoreline Opportuni- . The report recommends public preservation of important nat- areas and responsible planning for industrial areas to reduce effect on recreation values.

xty-six areas were identified as possessing important recreation es. At least three of these, Sleeping Bear Dunes, Huron Mountains, and Pictured Rocks, were believed to be of national signific e and were being studied in further detail at the end of the year.

## *River Basin and Regional Studies*

A report on Recreation Today and Tomorrow in the Missouri R r Basin, prepared in cooperation with the Missouri Basin Inter-Ag y Committee, was released. Cooperation with recreation group f interagency committees included participation in work of the kansas-White-Red Basins Inter-Agency Committee, the Colu a Basin Inter-Agency Committee, the Pacific Southwest Inter-Ag y Committee especially on the means of financing recreation deve ment under the provisions of the Colorado River Storage Project , and the U.S. Study Commission, Southeast River Basins on a d survey to identify "unusual areas" possessing recreation potential deserving consideration for meeting present and future recrea demands.

At the request of the Bureau of Land Management, the Ser undertook to provide recreation planning assistance on O & C la in Oregon.

## *Recreation Research*

The field of recreation economics was stressed in research stu made during the year, especially in connection with proposed nati seashore areas. Economic surveys of the proposed national seash at Oregon Dunes and Point Reyes were completed in collabora with private economic experts, and an economic study on the im of establishment of the proposed Cape Cod seashore was condu under contract. Survey work was completed also on a study of economic impact and sociological effects of recreation use of t reservoirs in the Missouri River basin.

Reports are in process on two special studies being made u contract: (1) a study of present and future needs for organized ca ing facilities to provide camping opportunities for children in 9–16, and (2) a nationwide sample survey to help measure long-t demand for public parks and recreation areas and the types of outd experiences that are sought.

A special survey of the demand for water resources for recrea use was made at the request of the Senate Select Committee on tional Water Resources.

## *Advisory and Consultative Assistance*

Assistance was given to 47 States on 628 occasions on a wide var of problems. The amount of such assistance furnished has been

*t Laramie in Wyoming, like many other National Monuments, recalls America's y frontier history and the opening of the West.*

asing gradually for some years, but it is still inadequate to meet requests arising from the States' expanding recreational programs.

)ne of the more significant examples was cooperation with the ssouri State Park Board in adapting Service master-planning pro- ures to the preparation of a master plan for Van Meter State Park. ter approval by the Board, it is hoped that this may serve as a de for other master plans.

\nother important example is a comprehensive study of the 50,000- e Custer State Park being undertaken on a reimbursable basis at request of the South Dakota Department of Game, Fish and rks to determine needed acquisition, development, protection and erating methods and procedures required for continued administra- n as a State park on an adequate and proper basis.

This annual edition of a compilation of reports by State park encies made upon request of the National Conference on State rks, reveals (1) 2,433 State parks, historic sites, and related types recreation areas, embracing nearly 5.7 million acres, (2) attendance excess of 255 million, including 18 million overnight guests, (3) ex- nditures of $51 million for operation and maintenance and $37 mil- n for capital improvements, (4) revenue from operations amounting nearly $21 million, and (5) 6,966 year-round and 9,724 seasonal sonnel.

*Keeping picnic grounds in the national parks neat and tidy is an unending for park personnel which has to cope with man and beast.*

## *Real Property Disposal*

Recommendations were furnished to General Services Administ tion for conveying to the States and their political subdivisions park, recreation and historic monument purposes, 28 Federal surp properties embracing 2,066 acres.

Most significant was the former Sampson Air Force Base n Geneva, N.Y., with 3 miles of frontage on Seneca Lake, the largest the Finger Lakes. The Service now has responsibility for enforci compliance with the conditions of the deeds on 189 properties wit total of 31,872 acres.

The Bureau of Land Management was furnished recommendati on 40 applications from State and local agencies to acquire pub domain lands for park and recreation purposes.

### ervoir Planning and Management

ineteen recreation reports were prepared for the Department's eau of Reclamation and also 19 for the U.S. Army Corps of ineers. A management agreement was negotiated with the Colo- State Park and Recreation Board for the operation and mainte- e of the recreation area on the Bureau's Vega Reservoir.

## Operations

ecommendations made by the management survey teams during year should strengthen the Branches of Programs and Mainte- e. The former has been given expanded functions relating to ating programs and the latter will be enabled to carry forward re dynamic maintenance program for the parks.

he Branches of Concessions and Lands have achieved substantial lts, respectively, in their fields of providing more and improved or accommodations and eliminating inholdings, despite serious acles which have had to be overcome.

robably the most difficult problem ahead in the land acquisition is the acquiring of inholdings at Antietam National Battlefield , Gettysburg National Military Park, and other Civil War battle- areas, before the forthcoming centennial observances.

### d Acquisition

uring the fiscal year $1,700,000 was appropriated for land acquisi- , of which $450,000 was allotted to the purchase of lands in Civil areas. Some 20,685 acres of inholdings were acquired by pur- e, donation, transfer, or exchange.

onations of land included 640 acres from the State of Texas for Bend National Park; 1,322.75 acres and 37.50 acres from the State North Carolina and the Eastern National Park and Monument ociation, respectively, for addition to the Blue Ridge Parkway; 1,284 acres from the State of Tennessee for the Foothills Parkway, at Smoky Mountains National Park.

ompleted purchases and approved options cover some 5,385 acres and in Glacier, Isle Royale, Rocky Mountain, and Yosemite Na- al Parks; Fort Frederica, Joshua Tree, Petrified Forest, and Pin- es National Monuments; Colonial and Independence National orical Parks; Manassas National Battlefield Park; Theodore sevelt National Memorial Park; and Fort Clatsop National Me- ial Project.

*The unsurpassed grandeur of the snow-covered Logan Pass on the "Going to Sun Highway" in Glacier National Park leaves unforgettable memories to mill of visitors.*

## *Water Resources and Water Rights*

The special master's report on the *Arizona* vs. *California* suit o Lower Colorado River water rights was submitted to the Supre Court in May. The special master limited allocation to the wat of the main stem of the river. The right to the quantity of wa from the main stem, which is being used at Lake Mead Natio Recreation Area, and the right to unspecified increased future use, needed, were recognized.

Federal rights to the use of waters tributary to the Colorado Ri remain unaffected at Lake Mead and the other 22 parks and mo ments in the Lower Colorado River basin. These rights were rec nized as being based both on appropriation under State laws a on Federal withdrawal and reservation of the areas.

## *Concessions Authorizations*

Six concession contracts were negotiated. Five of these includ construction programs—three at Lake Mead and one each at Ca Hatteras and Yosemite. Of the six contracts negotiated, three ha been finally executed on behalf of the Government.

he review of concession contract language and policies within the I artment has caused this activity to be temporarily suspended.

### spectuses

even prospectuses were issued soliciting offers for facilities at Big I d, Glacier, Isle Royale, Natchez Trace, Blue Ridge, Glacier Bay, a Fort Jefferson. The Big Bend, Isle Royale, and Blue Ridge prosp tuses resulted from the decision that no action be taken on the r uest of National Park Concessions, Inc., for a new contract and t directive that prospectuses be issued for each area in which it o rates.

he only offer received in response to the Big Bend prospectus was s mitted by National Park Concessions, Inc., and was conditioned u n its being authorized to continue operations at Mammoth Cave. A contract is being negotiated as a result of the Natchez Trace p spectus.

### sion 66 Control Schedules

he Mission 66 Control Schedules for the parks were revised to i ude requirements for new areas and increased costs. Also, schedu s for operating programs were included for the first time.

n preparing this 200-page document, the original Mission 66 estim es for operating programs were reviewed in cooperation with repres tatives of the Mission 66 Staff and the Branch of Finance. New e mates were developed, taking into account factors not known when t original estimates were prepared in 1955.

n addition to revised control schedules, a 150-page, 6-year prog m of public works projects was prepared in compliance with Bureau o he Budget requirements, and a tabulation showing estimated costs o Federal, State, and nonurban recreational developments for the 1 fiscal-year period, 1961-1975.

### erating Programs

s a result of recommendations of the management survey teams, t Branch of Programs has been assigned final responsibility for all o rating programs, and for developing procedures leading to the p paration and submission annually of formalized programs for all s vice functions.

rocedures are in the process of prepartion and it is expected that y will be put into effect during the 1961 fiscal year.

### Maintenance

Attention has been focused on park needs where water-borne tr portation units and floating equipment are essential to efficient m tenance and operation. Arrangements have been made with e Chief of Transportation, Department of the Army, to secure a t and barges for Isle Royale National Park and a supply ship for F t Jefferson National Monument.

The Commandant, U.S. Coast Guard, has cooperated in furnisl technical assistance in converting several gasoline-powered craf t Lake Mead to diesel power for more efficient operation and gre safety.

## Design and Construction

In fiscal 1960, 1,252 projects were included in construction progra of the National Park Service, including carryover projects fr previous fiscal years. By June 30, 1,097 of these projects were co pleted or under construction.

Severe damage to facilities in Yellowstone National Park due the recent earthquake, and damage incurred by volcanic activity Hawaii National Park, required immediate remedial measures to p vide facilities for public safety and protection of Government pr erty requiring temporary postponement of some construction proje originally contemplated.

### Roads and Trails

Eighteen major roads projects were completed, amounting to miles of stage reconstruction or completion at a cost of $9,883,9 Twenty-one projects totaling $9,181,413 were started during the yea one for $41,994 has been completed; the 20 remaining totaling $9,12 920 added to six previously started projects costing $4,801,299 mak a total of 26 projects costing $13,930,219 under construction at the e of the year.

Important projects consisting of reconstruction completed duri the year were 20 miles of the Tioga Road at Yosemite National Par 5 miles of the Rio Grande Road at Big Bend National Park, 14 mil of the park road at Mount McKinley National Park, 7 miles of t Peaceful Valley Loop Road at Theodore Roosevelt National Memori Park, and 14 miles of the Cedar Pass Pinnacles Road at Badlan National Monument, and 5 miles of the Park Entrance Road at Me Verde National Park.

## kways

he National Parkways construction program concentrated on s eral parkways and provided additional visitor facilities along the c pleted sections. Of the $16 million contract authorization pro- v ed by the Federal-Aid Highway Act of 1958, $240,000 was pro- g med for the Baltimore-Washington Parkway—Maryland; $1,413,- 7 for the Blue Ridge Parkway—Virginia and North Carolina; $ 0,000 for the Colonial Parkway—Virginia; $1,661,000 for Foot- h s Parkway—Tennessee; $2,809,800 for the George Washington M morial Parkway—Virginia and Maryland; $6,365,000 for the N chez Trace Parkway—Alabama, Tennessee, Mississippi; $165,000 f the Palisades Parkway—District of Columbia; $35,500 for t Rock Creek and Potomac Parkway—District of Columbia, a $200,000 for advance planning.

n amount of $2 million additional contract authority was provided b the Federal-Aid Highway Act of 1959 for relocation of a portion c he Natchez Trace Parkway to be flooded by creation of the pro- p ed Pearl River Valley reservoir near Jackson, Miss.

uring the year 32 individual major projects were completed with a tal value of $16 million. The completion of the 18-mile section of t Blue Ridge Parkway in Virginia extending from U.S. No. 60 s thwesterly to the existing Peaks of Otter section including the 1 0-foot long James River bridge, was a major accomplishment. e opening of this section eliminated a 25-mile detour and provided r torists with a 211-mile scenic drive from the northern boundary of S enandoah National Park to U.S. Highway No. 460 near Roanoke. -mile extension of the George Washington Memorial Parkway in ginia from Spout Run near Key Bridge to the Central Intelligence ency Headquarters site was opened. On the Natchez Trace Park- y in Mississippi 35 miles were completed on the Jackson-Tupelo t. Numerous picnic ground facilities, campground roads, comfort tions, maintenance buildings and utility systems were completed.

orty-five major contracts totaling $23,715,000 were in process under t Bureau of Public Roads program. They include two projects on t 5,036-foot long Tennessee River bridge in Alabama to carry the tchez Trace Parkway over the Pickwick reservoir, and the begin- g of grading work on the Foothills Parkway in Tennessee.

ield studies were provided jointly by the Bureau of Public Roads the National Park Service on the location of the Great River ad in Arkansas. All 10 Mississippi River States were provided h similar advisory service.

### *Buildings*

Emphasis on visitors' facilities continued. The building const tion program included 18 visitor centers completed or nearing c pletion, with 7 additional ones under construction or reaching contract stage. Eighty-four projects involving over 100 hist buildings or structural remains were in progress.

There were 87 permanent dwelling units; 55 multiple units seasonal buildings and a dormitory under construction. Dur hearings on the 1961 fiscal year budget, the Service's Revised Sta ard Plans for Employee Housing were reviewed by a House S committee on Appropriations. The fund limitation of $20,000 in 1960 was retained, but a basis was established for clearance projects expected to exceed that amount.

Programing of the Jefferson National Expansion Memorial geared to commemorate in 1964 the sesquicentennial of the foundi of St. Louis. Revisions in planning and construction since 19 necessitated several additions and adjustments in the professio services contracts. The architects are currently completing stud of the design, structural and mechanical phases of the memor arch features.

The Historic American Buildings Survey continued recordi historic structures with the aid of summer-student teams and throu widening collaboration with professional and historical organizatio universities and preservation groups. In the Virgin Islands a gra by the Jackson Hole Preserve brought to realization the longstan ing plans of the Royal Academy of Fine Arts in Copenhagen undertake a survey of early Danish architecture, under the sponso ship of HABS.

### *Utilities and Miscellaneous Structures*

Major emphasis was given to simplification of design and accele tion of construction of campground and related utilities. Particul attention was given to effecting economies consistent with good pra tice and National Park Service policy, with respect to number a location of necessary water fountains, lighting, comfort stations, a hydrants necessary for fire protection.

Following a study made for the National Park Service by a specialist on beach erosion, action was initiated in cooperation wi the State of North Carolina to provide sand fixation and hurrica protection at Cape Hatteras National Seashore. The objective to develop an effective barrier against the forces of nature whi erode the beach. The design of the Cruz Bay marina to serve t Virgin Islands National Park was completed. Fifty-eight new se systems were completed and 66 new water systems increased er storage facilities by 2,219,275 gallons. Eighteen new camp- unds were completed as well as 978 additional campsites.

### ter Plans

n the new format which was developed in a Mission 66 study the ter plan for each park is expected to become an increasingly im- ant and useful document.

he individual plans will define the overall objectives and controls establish basic requirements for all elements of a park program. correlation of development to the requirements of administration, ection, interpretation, and public accommodations will be greatly ngthened. Similarly, the conduct of other programs will have r basis in a single document thereby assuring unified direction in mplishing stated objectives.

## *National Capital Parks*

n estimated 45 million persons used National Capital Parks park lities in fiscal 1960, with more than 5 million visitors counted at five major national memorials. There were 367 special events nded by over 2½ million persons, representing a 73 percent in- se in special events over 1958 and a 30 percent increase over 1959.

### *sion 66 Improvements*

5-mile section of the George Washington Memorial Parkway g the Virginia Palisades was opened by President Eisenhower November 3; the Old Stone House in Georgetown was furnished placed in operation as a historic house museum on January 24; House Where Lincoln Died underwent major rehabilitation and reopened to the public by the Secretary of the Interior on July 4; Netherlands Carillon Tower was accepted on behalf of the people he United States by the Secretary of the Interior on May 5; the k Creek Nature Center was dedicated on June 4; and a new staff rters at camp 5 and paving circulatory roads were completed rince William Forest Park.

new recreation building at camp 2 was constructed at Catoctin ntain Park; major road improvement was undertaken in Rock ek Park and extensions of parking areas completed at the Carter ron Amphitheater and Mount Vernon; extensive planting and roved landscaping was accomplished throughout the park system, uding the addition of 4,687 trees and 7,827 shrubs. Major land- pe improvements were made to 14 separate park areas.

### *Planning and Land Acquisition*

A contract was awarded for the design of a six-lane Lincoln Memorial underpass and redevelopment of the Lincoln Memorial Plaza. A lease agreement was negotiated between the Potomac Electric Power Co. and National Capital Parks for 790 acres of wilderness-type land at Great Falls, Va., for a period of 50 years. Such agreement will insure protection for this rugged natural area and may provide for its eventual inclusion as a key unit in the National Capital Park System.

## *Budget and Finance*

While the Service's 1960 appropriations for construction of buildings, utilities and other facilities were less than the amount appropriated for 1959, appropriation increases were provided in 1960 to strengthen the operating programs. There follows a comparison of the 1960 appropriations with those for 1959:

| Appropriation item | 1959 fiscal year | 1960 fiscal year | Increase (+) or decrease (−) |
|---|---|---|---|
| Management and protection | $16, 056, 200 | $16, 772, 000 | +$715, 8 |
| Maintenance and rehabilitation of physical facilities | 12, 477, 100 | 14, 435, 000 | +1, 957, 9 |
| General administrative expenses | 1, 429, 300 | 1, 475. 000 | +45, 7 |
| Construction | 20, 000, 000 | 16, 735, 000 | −3, 265, 0 |
| Construction (liquidation of contract authorization) | 30, 000, 000 | 30, 000, 000 | |
| Total cash appropriations | 79, 962, 600 | 79, 417, 000 | −545, 6 |
| Construction (amount by which roads and trails and parkways contract authorization exceeds cash appropriation) | 2, 000, 000 | 6, 000, 000 | +4, 000, 0 |
| Total new obligational authority | [1] 81, 962, 600 | 85, 417, 000 | +3, 454, 4 |

[1] Includes $14,765,500 of 1959 contract authorization for roads and trails and parkways construction advanced to the 1958 fiscal year for obligation.

### *Financial Management*

At the close of the fiscal year, the Service's program for improvement in financial management, which has been in progress since 1954, was nearing completion. One important feature of the program virtually completed during the year was that of inventorying and placing under accounting control all of the fixed assets in the park areas that were acquired or constructed prior to the installation of the new accounting system.

For the first time in its history the Service now has complete inventories of all its fixed assets and under the new accounting system such inventories will be kept current at all times. Steady progress was made in the review and revision of the draft accounting handbook which should be ready for General Accounting Office consideration and approval within a few months.

# *Office of Territories*

## Anthony T. Lausi, *Director*

* * *

I TERRITORIAL ADMINISTRATION, the fiscal year 1960 c minates a decade notable for the achievements of these areas in s -government.

n 1950 the Congress enacted organic legislation for Guam and laid t basis for commonwealth status for Puerto Rico attained in 1952.

n 1951 the administration of American Samoa and the Trust Ter- r ry of the Pacific Islands was transferred from the Navy Depart- nt to the Department of the Interior.

n 1952 the constitution for Puerto Rico was approved, and in 1954 t Congress enacted the Revised Organic Act for the Virgin Islands.

he long-sought goal of statehood for Alaska was achieved in 1958 a l for Hawaii in 1959.

merican Samoa in the South Pacific gained legislative authority f the first time through approval of the first constitution of Ameri- c Samoa by the Secretary of the Interior on April 27, 1960. Under t leadership of their Samoan-born Governor, Samoan leaders in nstitutional Convention painstakingly reviewed each section of t ir constitution which they unanimously adopted after full discus- s n and debate.

ighlighting the recognition of the progess of the Territory of am in self-government was the appointment of the Honorable eph Flores as Governor of Guam, the first American of Guamanian estry to be so appointed.

Through education and training the inhabitants of the Trust Ter- ory of the Pacific Islands increased their participation and respon- ility in governmental affairs, economic growth, and the public fare.

Vith strong support of the President, legislation was introduced the Congress to provide Guam and the Virgin Islands with non- ing representation in the United States House of Representatives.

During Congressional hearings, witnesses from both Territories d the Department of the Interior recommended enactment.

### *Greater Resource Use*

Political developments were matched by significant advance n the economies of all Territories. Total local revenues collected ing the fiscal year reached new heights as a result of intensive ef s to develop the local resources. Major emphasis on public wel e measures will enable a better educated and more healthy you r generation to assume future leadership.

These rapid changes in the developing Territories, because y were accomplished by the participation of the people themse s, have taken place in an atmosphere of stability and without the rupting effect on social and cultural patterns of the people wh have occurred in some of the other areas of the world. A firm fo dation has thus been laid for further progress in political, econo and social development in the Territories.

## *American Samoa*

The promulgation of the first constitution for American Samoa the Secretary of the Interior on April 27, 1960, was the most signific event of the year in American Samoa.

The constitution was written by a drafting committee after 6 ye of study and preparatory work by a prior committee establishe 1954. The Constitutional Convention, held April 20–26, gave in sive consideration to every provision of the constitution. Each the 68 members of the convention, selected by village councils acc ing to custom and tradition, spoke and debated. The mem included the ranking chiefs and most of the legislature. Unanim agreement was hammered out by full debate and compromise us the Samoan language throughout.

In a historic ceremony, 5,000 persons witnessed the signing of constitution by each member of the convention, followed by Governor and the Secretary of the Interior, whose signature mar the final act of approval and promulgation.

The signing climaxed a 2-day ceremony commemorating the 6 anniversary of the raising of the United States flag on Samoan in 1900.

A significant feature of the Flag Day and constitution ceremo was the raising of the first flag of American Samoa.

The past year witnessed the acceptance of the Governor of Ameri Samoa for the first time as a member of the national Governors' C

*mpanied by Peter Tali Coleman, Samoan-born Governer of American Samoa, etary of the Interior Fred A. Seaton completes the final act of signing the first titution of American Samoa on April 27, 1960. The actual signing of this titution by the 68 delegates to the Constitutional Convention, Governor Cole- and Secretary Seaton was witnessed under sunny skies by more than 5,000 le on the occasion of the 60th anniversary of the raising of the United States in American Samoa. One of the signers, High Talking Chief Mulitauaopele otu, looks on.*

nce. Legislative leaders also participated in conferences at the onal level. The president of the Samoan Senate and the speaker he Samoan House attended the National Legislative Conference . in October 1959 in Denver, Colo., followed by a visit of two legis- rs to observe legislative processes during the first session of the vaii State Legislature.

## *roved Transportation*

ir and surface transportation to and from Samoa improved during year. Weekly flights commenced in October 1959 between Samoa

and Honolulu and daily flights now connect the two Territorie of
American Samoa and Western Samoa. In July 1959, asphalt r-
facing was placed on the existing 6,000-foot airstrip to help ac n-
modate larger aircraft. The timely procurement in June of a l re
amount of heavy construction equipment from excess stocks is x-
pected to permit meeting the scheduled completion date of mid- 2
for the new jet airport.

The level of economic activity continued to increase. I al
revenues reached the $1 million mark for the first time, for a al
figure of $1,003,923.49 as of June 30, 1960.

## *Health Activities Increased*

Intensive efforts were devoted to public health activities and e-
ventive medical care. The employment of a Sanitarian with a b k-
ground in public health helped to strengthen and expand Won e's
Health Committees and subdispensaries in each village.

Visitations by medical and public health teams to each village r
baby clinics and cleanup campaigns have led to improvement n
sanitary facilities and practices, lessened the incidence of intest l
diseases and eye and skin diseases, and resulted in reduced hosp il
admissions. Health education introduced into the strong Samoan -
ture has been the keynote. The visit of a South Pacific Commis n
health education specialist helped develop the village health educa n
program.

At the request of the Governor, the United States Public He
Service sent a medical team to American Samoa to make a lep
survey. The survey report was expected in the next fiscal year.

## *Guam*

Major enactments of the 1960 Guamanian legislative session w
Land Recording Law; Marketable Title Act; Amendments to e
Uniform Security Act; Financial Responsibility Law; authorit o
enter Western Interstate Correction Compact; disclosure of juve e
violators, and abolition of the Office of Police Court Judge.

Notable projects in government operations and service to the p
were reorganization of the Public Health Division and initiatio f
programs in Maternal and Child Health Care, Crippled Chil n
Services and Clinics for the Aged. Four public health buildings e
completed in Asan, Mangilao, Piti and Talofofo Villages.

Economic trends were encouraging. A commercial airline e
panded its service to Guam and Okinawa, and the major airline
serving Guam has extended jet service to Guam.

*Tumon Junior-Senior High School, Guam.*

memorandum of understanding was signed between the Governor the commander, Naval Forces Marianas, granting an additional ver allocation to the civilian community. A joint Guam-Navy ture was underway for the construction of a new generating plant the installation of a mobile unit supplementing present power duction.

n order to continue to provide more efficient service at the commer- port, and to reduce rates and tariffs, new facilities were installed, uding a new carrier agents building and a rehabilitated, retract- fender system. Authorization was obtained to construct a 300- warehouse for incoming vans and lumber.

### cation Progress

uring the year, both George Washington High School and Tumon ior-Senior High School were accredited by the North Central ociation of Colleges and Secondary Schools and the Territorial lege received continued accreditation from the Western College ociation.

he Trade School was opened and will help alleviate the critical rtage of skilled and semiskilled workers. Construction of the Ter- rial College and the Tumon Junior-Senior High School was com- ed. Construction of the Agat Junior High School and 16 new srooms at Andersen Elementary School was under way with pletion scheduled for the first half of fiscal year 1961. Design racts were entered into for Barrigada Junior High School and t Barrigada Elementary School.

he agricultural program emphasized modern techniques of farm- and the new Division of Wildlife and Fisheries was established recruitment of technical personnel.

*Trust Territory of the Pacific Islands—Young women as well as men show im*
*in science experiments at PICS (Pacific Islands Central School), in Ponape.*
*school offers high school training to students from all districts of the T*
*Territory.*

## *Trust Territory of the Pacific Islands*

Through education, training and cooperative effort, the 73
Micronesians inhabiting approximately 90 atolls and islands (s
2,000 other atolls and islands are uninhabited) are being prepare
assume an increasing share of the responsibilities for governm
economic growth, and public welfare.

Opportunities are being offered through improving school fa
ties at home, grants for study abroad, and in-service traini
Through on-the-job experience and local-government participat
increasing numbers of Micronesians are acquiring the skills to ca
out the varied functions of this threefold program.

Within the Executive Branch, three Micronesians were promote
newly established positions of administrative aide, fortifying th
previous education and training with high level administrative wo
Throughout the districts and departments, Micronesians have be
advanced to higher grades.

In the legislative field the program of chartering municipalit
gained momentum through diligent efforts of Micronesians on distr
staffs, who visited outlying communities in teams to explain a
answer questions on functions and procedures of chartered munici

government. District congresses accepted added responsibilities in fields such as education and youth fitness.

Designation of a social affairs subcommittee which met in the interim between the 1959 and 1960 Inter-District Advisory Committee Conferences enlarged the scope of this annual gathering of Micronesian leaders. A trade fair for exhibits of crafts and products was scheduled in connection with the 1960 Conference.

## *Local Economy Improving*

Fisheries and cacao were emphasized as a part of the economic development program. As the result of a Government pilot fisheries project in Palau and a newly organized fisheries cooperative in Ponape, fish production, sales and exports soared over any previous year under United States administration. A partial subsidy to stimulate cacao plantings met enthusiastic response and many new stands were established. The first commercial shipment, although a small sample run, was exported to test acceptance in the world cacao market. Coconut rehabilitation continued.

In two districts, trading companies functioned successfully under all Micronesian management. Selected Micronesian personnel from the districts, brought to headquarters in small groups, received advanced training in their respective occupations.

## *Educational Advancement*

Great emphasis was given to the advancement of Micronesian education. Eight Micronesians on government scholarships are working toward college degrees; 29 are in colleges in the United States, Guam or the Philippines on 2-year or special government grants, while various others are studying abroad under private auspices.

A major event was the dedication of the new Pacific Islands Central School (PICS) with an enrollment of 140 representing all districts. Set amidst the mountains of Ponape, the new high school includes a library, auditorium, classrooms, science and vocational arts buildings, and three dormitories. Two qualified Micronesians appointed to the PICS faculty served effectively, along with six Americans.

Reorganization and standardization of elementary school curricula were completed. Training sessions for elementary teachers continued and teacher trainers visited island schools providing guidance and assistance. Additional elementary schools were built with the help of government grants-in-aid.

In public health all district programs came under Micronesian direction. Two American doctors supervised and provided training.

*A single family unit of the Virgin Islands Emergency Housing Program.*

Eleven students, one a young woman, are preparing for careers as medical officers at Central Medical School, Suva. Two of the eight "degree" students entered the University of the Philippines for work leading toward M.D. degrees, the first to embark upon medical-degree study under government sponsorship.

Other public health training included the School of Nursing at Palau, a newly formed continuous 2-year School for Dental Hygienists in the Marshalls, a course in community hygiene and sanitation held at Truk, specialized training for medical officers at the Naval Hospital, Guam, and a continuing program for health aides in all districts.

## *Virgin Islands*

Operations of the government of the Virgin Islands showed notable improvements during fiscal year 1960. Government services were strengthened and revenues were the highest in the history of the territory.

Local revenues collected during the fiscal year totaled $7,274,353.6 an increase of 38 percent. Total Internal Revenue Matching Funds amounted to an additional $4,917,952.15.

The Office of the Government Secretary continued to develop a modern real property tax assessment program. Directed by experienced tax consultants, work progressed on surveying and mapping of real property and the establishment of uniform and equitable assessment criteria and procedures.

The population of the Virgin Islands as of April 1, 1960, according to preliminary count of the returns from the Census, was 31,904 as compared with 26,665 on April 1, 1950.

The Department of Tourism and Trade estimates that over 200,000 visitors came to the Virgin Islands. The gross tourist revenue was estimated at $24 million, a substantial increase over the preceding year.

### *Water Problems*

The lack of a continuous supply of potable water remained a major problem. Improvement in the supply situation was effected when a contract was signed with a private concern to haul water from Puerto Rico. Though records show a total rainfall of 58.43 inches in St. Thomas, the island suffered one of its severest droughts, not relieved until the flood of May 8–9, 1960. The flood, however, caused severe damage to roads, streets, sewers, potable and salt water lines, and other public facilities.

In the Department of Health, two full-time house physicians were added to the staff of the hospitals in St. Thomas and St. Croix. The Department of Social Welfare cooperated with the Commission on Aging in studying the needs of senior citizens in the Virgin Islands. Completed units in the Emergency Housing Program provided quarters for 19 families totalling 97 persons. Additional units have been purchased and are under construction.

In public safety, highway patrol activities were increased, a system of uniform traffic tickets instituted, and additional patrolmen employed in both islands. There has been a drastic decrease in the highway accident and fatality rate.

The Department of Agriculture and Labor recently appointed a marketing specialist to conduct a study of demand and supply schedules for farm products in order to promote an improved diversified agricultural program.

### *Government Comptroller*

The Office of the Government Comptroller of the Virgin Islands, created by Public Law 517, 83d Congress, approved July 22, 1954, has operated as a Federal agency under the supervision of the Secretary of the Interior since July 1, 1959. The functions of the Government Comptroller's Office are somewhat similar to the functions o he General Accounting Office.

During fiscal year 1960, the government comptroller made se al comprehensive audits and a number of limited audits. The ait of all cashiers' receipts beginning with September 1, 1957, was un ertaken and other reports and investigations were made from tim o time. An important function of this office is the certification o et revenues made yearly for matching fund purposes. The comptr er also prepares an Annual Report on the Financial Condition o e Government of the Virgin Islands.

The comptroller's office is also responsible for validating all d uments for essential public projects and the submission of quart ly progress reports thereon.

## *Virgin Islands Corporation*

Electric facilities in the Virgin Islands have been severely ta ed by the rapid expansion of tourism, the establishment of new in ustries, and home construction. Power expansion plans have b en accelerated and combined with the program to provide badly nee d potable water for St. Thomas. Engineering studies for construc ion of a salt water distillation plant with a minimum capacity of 250 0 gallons per day have progressed and the major components are un r contract. The plant is expected to be in operation in late 1961.

Power activities showed a loss over the past year and substan i maintenance costs were necessary to keep all available equipment op rating at full capacity. Failure of a new 2,500-kilowatt generat r unit required installation of emergency generating equipment on S Thomas. Through the cooperation of the Navy a serious outage w averted, and increased loads were met. The growth of St. Cr also severely taxed generating facilities, and a 2,500-kilowatt genera is planned as an addition to this system by mid-1961.

Severe drought conditions set back production and processing o sugarcane, the principal activities of the corporation on St. Cr i Only 71,076 tons of sugarcane were ground and 6,970 tons of sug r raw value, manufactured. This was some 6,000 tons of sugar l s than the previous year, also a mediocre year. A study of rainf l over the past 15 years shows a close correlation between total rainf l rainfall during the last 6 months of the growing period, and yield o sugarcane.

The earth dams construction program on St. Thomas and St. Cr i continued. Six dams with an estimated capacity of over 8 milli n gallons were completed, and the impounding capacity of two ol e dams was increased. The program in terms of flood control a d prevention of soil erosion has proved its value many times over.

he Forestry Programs showed steady progress. St. Croix mahog- has attracted the attention of a number of artisans who have eloped high quality products for sale.

## *Alaska Public Works*

1949, by Public Law 264, the 81st Congress authorized a $70 ion program of public works in Alaska to foster economic and l development through provision of facilities for community This 5-year act was later extended to June 30, 1959.

nder this program the Federal Government, upon application by blic body in Alaska, finances the entire cost of construction of ap- ed projects and, upon their completion, transfers them to the ap- nt at prices that will return to the Treasury of the United States less than 50 percent of the total cost.

hrough June 30, 1959, congressional appropriations totaling 76,200 have become available. Allotments have been made in mount of $69,286,150 to 172 projects to provide schools; hospitals health centers; municipal buildings; sewer and water projects; r projects such as streets, utilities and small boat harbors; and gency relief units. Of these, 156 projects valued at $58,284,000 omplete. Another 5 projects estimated to cost $4,091,400 are sub- tially complete and in use, and 11 with an estimated value of 9,850 are in the construction stage.

# The Alaska Railroad

Robert H. Anderson, *General Manager*

★ ★ ★

OPERATIONS OF THE Alaska Railroad produced gross reven of $14,538,646.27 during the fiscal year. Expenses amounted $14,307,374.87. The net income of $231,271.40 was adjusted, h ever, to give effect to policy changes with respect to depreciation r and the acounting treatment of losses on retirements of nondeprecia properties. Depreciation charges were increased by $489,726.38, wh resulted in a deficit of $258,454.98 for the year.

The railroad carried 1,248,542 revenue tons of freight during year, a decrease of 1.89 percent compared with the prior year. Re nue passengers totaled 76,991 compared with 79,462 carried during prior year, or a decrease of 3.11 percent.

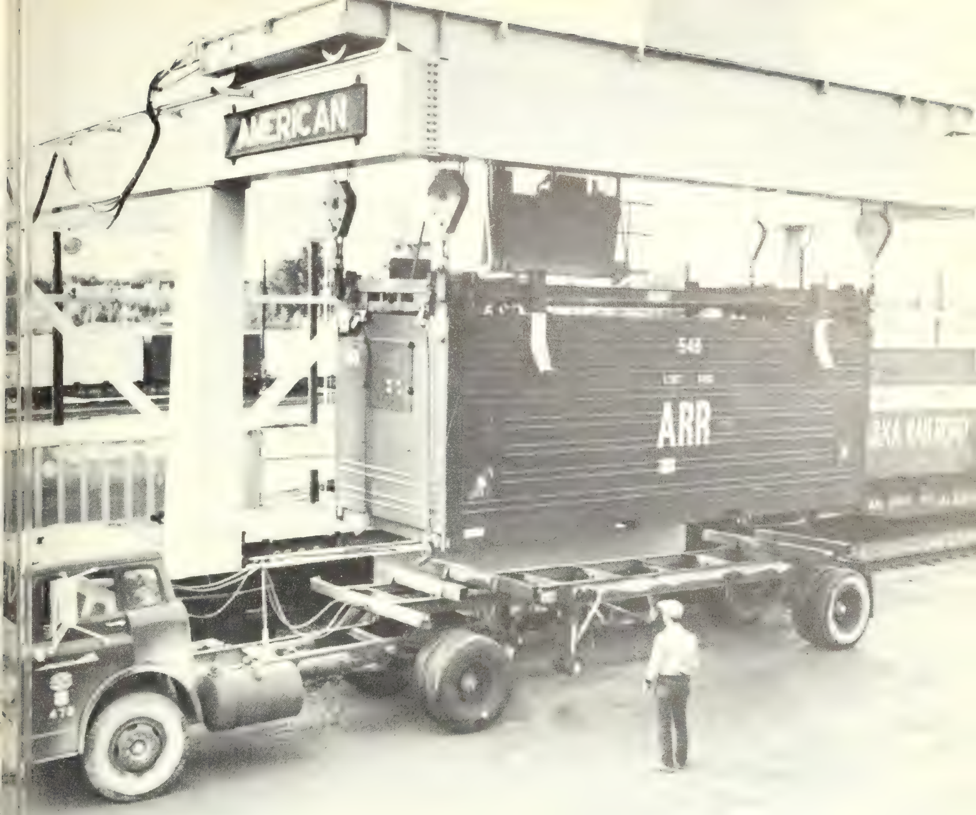
After several years of negotiation, the railroad disposed of its in est in the Knik Arm Power Plant, a steam power facility loca at Anchorage, Alaska. The purchase was made by the Chug Electric Association, Inc., joint owner of the plant, at a price of proximately $2,350,000.

On December 16, 1959, the Secretary designated the railroad a bureau of the Department of the Interior, reporting to the Assist Secretary for Public Land Management.

During fiscal 1960, the railroad completed the ballasting and renewal of some 30 miles of track north of Healy. Additionally, railroad began the ballasting and tie-renewal of an additional miles of track south of Curry.

On March 3, 1960, the Secretary dedicated the new passenger de at Fairbanks. The new depot replaced one built in 1923. At time the old depot was placed in service, it was served by a three-r track to permit standard gauge operation on the railroad's main li and narrow gauge operation on the Chatanika branch. The narr gauge branch was closed down in 1933.

A new section house at Garner, Alaska, was completed and pla in service during the fiscal year.



*T Alaska Railroad's new Gantry crane, able to lift 40 tons, makes child's play o loading one of the railroad's cargo containers from a flatcar to a waiting truck. T crane has greatly speeded the process of switching from train to motor truck.*

uring the fiscal year, the railroad completed and placed in operati an all-electric traveling Gantry crane, with a capacity of 80,000 p nds. This installation was made to facilitate the rapid transfer fi n rail freight car to motor truck of the unit rail vans used by the A ska Railroad and motor freight carriers of Alaska. This travelir crane is equipped with a special lifting device which enables the c e operator to fasten on to the unit rail boxes for lifting purposes b emote control.

# ffice of the Assistant Secretary
# *sh and Wildlife*

**s Leffler,** ***Assistant Secretary***

* * *

E RESPONSIBILITIES of the Assistant Secretary of the
rior for the Nation's fish and wildlife resources are great and
ed, including the direction of such diverse programs as—

> ▲ *Problems relative to such international questions as the width of the territorial sea;*
>
> ▲ *Plight of migratory waterfowl as the result of the long drought in nesting areas; and*
>
> ▲ *Improvement of fish and wildlife resources in Federal water-development programs.*

hile many of the activities under the direction of the Assistant
etary pertain to research, there are also direct management re-
sibilities, such as the management of migratory game birds, the
ection of endangered species, and the management of the vast
ge system which aids in the accomplishment of these two things;
the management of the Pribilof Islands seal herd and the
ation of about 100 fish hatcheries.

nerally speaking, research programs have two prime objectives:
ssure the continued supply and proper utilization of the val-
food supplies of the seas and to assure the continuation of a
able recreational resource. The results of research are trans-
into management practices by private and public agencies and
dividuals and firms.

carry out this vast and varied program, the Assistant Secre-
directs the United States Fish and Wildlife Service, which

is headed by a Commissioner and is composed of the Burea Commercial Fisheries and the Bureau of Sport Fisheries and life.

## *Migratory Waterfowl Problem*

During the fiscal year, one of the management problems o Bureau of Sport Fisheries and Wildlife related to migratory w fowl, which had poor nesting success because of drought condit The answer was obvious—shorter shooting time and smaller bag li

During the year, research, which had been underway for years, showed that there are three distinct dove population are the country, each population virtually independent of the ot This paves the way for consideration of the management of the m ing dove on the basis of these three areas instead of the custo nationwide management.

Studies relative to the protection and enhancement of fish wildlife resources in large and small river basin developments tinued. A comprehensive report to the Senate Select Committe National Water Resources summarized the problems of fish wildlife in relation to the water resources program.

Fishery research brought forth such things as the possibilit restoring the endangered Atlantic salmon by planting larger than has been done heretofore; more knowledge on how to hatchery trout survive in planted waters; and valuable informa on disease-resistant strains of trout.

Wildlife research continues. There was more "tooling up" ir big research program on pesticide-wildlife relationships; more s on the control of nuisance birds and on wildlife diseases and p sites; more work on animal damage and predator control.

## *Predator Control Research*

The work of the Bureau of Commercial Fisheries was hi successful in many fields. Laboratory research has found chem that control oyster predators without damage to desirable fis oysters, and larger tests are being made to prove the practicab of these findings. The Service's program on the Great Lake control the trout-destroying lamprey continues to bring resul

Exploratory fishing has discovered a good groundfish area the coast of Washington, a fine scallop bed off the coast of Flo hard clams off the coast of North Carolina, and some unused stocks in the Great Lakes.

An outstanding development of the year was the conclusive p that the unsaturated fatty acids which are so plentiful in fish e excellent depressants of the cholesterol levels in the blood of animals. So promising was the discovery that the unsaturated ls are now being clinically tested on human beings.

esearch is slowly developing and proving out a technique for tifying the origin of salmon taken on the high seas—the first step essary in any program of management of the salmon stocks of continents.

he establishment of more quality standards, extension of the ection service, and more research on refrigeration are advancing program aimed at providing the consumer with the best possible ery products. Economic studies, market analyses, and the anal- of foreign trade problems are some of the other types of research ormed by the Bureau of Commercial Fisheries.

# *sh and Wildlife Service*

### nie J. Suomela, *Commissioner*

E OFFICE of the Commissioner of Fish and Wildlife reports no eement was reached at the second United Nations Conference on Law of the Sea, held in Geneva, Switzerland, March–April 1960, chieve worldwide agreement on the extent of national jurisdiction r fisheries in coastal waters.

he work of the first United Nations Conference on the Law of Sea, held in Geneva, March–April 1958, moved a step closer to ition, however, as the Senate gave its advice and consent to ratifica- n of the Convention on Fishing and Conservation of the Living sources of the High Seas on May 26, 1960.

he existing international fishery commissions have made steady gress in international cooperation in the conservation of fishery ources, and at the end of the year, a new commission, composed of resentatives of the United States and Cuba, and concerned with shrimp resources in the eastern Gulf of Mexico, held its organiza- nal meeting.

ishery technicians were on assignment to 14 countries during part all of the year. In addition to numerous visitors, a total of 14 dents and observers arrived in the United States for extended fish- training.

## *nservation Education*

ctivities of the Office of Information were highlighted by two ormational programs on migratory waterfowl. During the fall nths, efforts were concentrated on acquainting hunters with the ght of the migratory waterfowl, which had been hampered during the nesting season by extended drought on breeding grounds A special program was conducted to cut crippling losses resulting hunters shooting at too distant a range. Another phase of the gram was to alert the hunter to the need for waiting until the came in close enough to permit identification to assure against kil the endangered redheads, canvasbacks, and ruddy ducks by mist

In the spring, the drive for the after-season sale of hunting sta was launched. The purpose of this program was twofold: Additi stamp sales means increased funds for the purchase of water habitat, and also affords the opportunity to acquaint the public its responsibility in the protection of wildlife resources.

In both campaigns, the press, radio, and TV cooperated fully, a correspondingly good reaction from the public. There was fine support from other conservation agencies—both State and priv

The Office of Information also added several circulars to its *Con vation Notes* series, inaugurated a new information service for outd writers and editors called Conservation Backgrounds, set up fish wildlife exhibits at several outdoors expositions, besides carrying its regular activities.

# *ureau of Sport Fisheries and Wildlife*

**niel H. Janzen, *Director***

H GHLIGHT OF THE YEAR for the Fish and Wildlife Service's
reau of Sport Fisheries and Wildlife was the completion of a long-
ge plan to provide increasing opportunities for outdoor recreation
the Nation's growing population. The objective of this plan is
naintain satisfactory numbers of fish and wildlife for future gen-
ions despite the steady increase of human activities on the habitats
l by desirable fish, mammals, and birds.

he trend in the continental waterfowl population, especially
ing ducks, continued downward due mostly to drought and, to
e extent, drainage of wetlands. Through shorter seasons, reduced
and possession limits for redheads, canvasbacks, and ruddy ducks,
delayed daily opening, the migratory-bird regulations for the
9–60 season gave added protection to waterfowl.

uring the year, the Bureau recruited and trained technical person-
preparatory to the initiation, in fiscal year 1961, of an expanded
gram of land acquisition for the conservation of migratory water-
l. This expanded program is made possible by the 1958 amend-
it to the Migratory Bird Hunting Stamp Act which raised the
e of the "Duck Stamp" from $2 to $3 and provided that all of the
ipts from stamp sales, less costs of printing and distribution, will
spent to acquire lands for waterfowl. Henceforth, construction
operational funds for migratory bird refuges will be provided
ough Congressional appropriations.

he Bureau sent three aerial missions to observe the numbers and
ribution of waterfowl on important wintering areas south of the
ited States. For the first time, surveys were made in Venezuela
Colombia where a half million ducks were recorded. Nearly 3

million waterfowl were observed in Mexico and some 93,000 elsew in Central America.

The State of Alaska assumed responsibility for the managemen its fish and wildlife resources at midyear. As a result of the exten revisions in the Bureau's programs in Alaska, manpower was reali and greater attention given to migratory bird problems. The portance of waterfowl protection will be emphasized in native vill through educational programs.

## *Pesticide Problems*

The development and expanded use of new pesticidal chemicals continuing problem of increasing seriousness. More than 200 che cal compounds are now used as active ingredients in more than 6, pest-control products. The Bureau's research arm has expanded work of determining the direct and indirect effects of these chemi on animal life and of devising ways to minimize the hazards to va able fish and wildlife resources.

The Congress enacted legislation to increase the annual authori tion of funds for research on chemical pesticides; authorized fu for research on marine game fish; extended the Bureau's authority use surplus federally owned grain to prevent waterfowl depredatio authorized construction of a new fish hatchery in northwestern Pe sylvania; and amended the Black Bass Act to provide for interst commerce of fish or eggs for breeding purposes.

Fishery research and wildlife research staffs perform scient studies on a wide array of resource problems and provide informat basic to the management of our natural resources. Man is exert ever-increasing pressures on fish and wildlife by reducing or alter natural habitat through agricultural, industrial, and economic velopment, and as a result of his mounting recreational demands. search must anticipate and endeavor to develop methods for keepi abreast of these changes. Management techniques developed throu Bureau research are used not only by this agency but are applied the States and other public land-managing agencies.

## *Wildlife Research*

Increased attention was given this year to improving techniq for measuring waterfowl production and determining the effects hunting regulations on waterfowl.

In a cooperative study with the States in the Mississippi Flyw hunter kill of ducks was analyzed in terms of species, age, and from examination of more than 10,000 wings supplied by hunte

*Field-testing chemicals for controlling alligatorweed.*

e findings confirmed the Bureau's July field appraisal that produc-
n of the redhead, mallard, and canvasback was poor during the dry
9 nesting season. Good progress was made, also, in developing a
thod for measuring reproductive success of arctic nesters such as
e and snow geese through aerial counts of young and adult birds
their wintering grounds.

n extensive survey of waterfowl wintering grounds in Mexico,
de in collaboration with the Government of Mexico, showed good
d conditions in many areas. Much high-quality habitat was not
ng fully utilized, and waterfowl populations in many places were
er than previously observed.

everal promising chemical-control methods have been discovered
alligatorweed, now considered to be the principal aquatic pest
nt in the Southeast. Studies on this and other pest plants are
ned at developing effective control methods without hazard to
and wildlife. Surveys of waterfowl food plants were continued
Chesapeake Bay. Cooperative research was initiated on Eurasian
ermilfoil, an introduced plant that is threatening prime feeding
unds for canvasbacks and other waterfowl in the Susquehanna
ts and other waters.

asic studies of soil, water, and vegetation in relation to waterfowl
ribution, food habitats, and hunting were continued in the impor-
t wintering ground area of Back Bay and Currituck Sound.
ly experimental results show a correlation between increase of

waterfowl food and a slight increase in salinity in waters that norm
are fresh or mildly brackish.

Extensive banding of nestling mourning doves in the United St
has supplied information on dove movements from the time of fled
to the end of the annual hunting season. In cooperation with
International Association of Game, Fish, and Conservation Com
sioners, the Bureau is developing a national program of dove rese
and management.

## *Animal Damage Studies*

Under some conditions, wild animals may cause damage to c
or property; they may become a nuisance or a health factor; an
the vicinity of airports, the larger birds, especially, may be a haz
to human life and aircraft. An example of the latter problem i
Midway Island in the Pacific where albatrosses (or gooney birds)
impeding military operations. After sand dune leveling and bla
topping certain areas, as recommended by Bureau biologists
carried out by the Navy, a decrease of 90 percent in birds soar
over the runways was reported, and bird-aircraft strikes were m
reduced.

Emphasis was given to finding economical and acceptable meth
of controlling damage by blackbirds to crops. Losses of gra
amount to millions of dollars annually. Local and sporadic eff
at controlling blackbirds (which are widely distributed and num
in the millions) have been ineffective.

Two traps—still in the experimental stage—show promise of be
useful in controlling bird damage under certain conditions. W
the first, a floodlight trap, up to 100,000 blackbirds and starlings h
been trapped at winter roosts in a single night. The second, a de
trap, captured blackbirds in fields where other techniques failed
cause of abundance of natural food.

Certain corn varieties have been found to be more resistant to bi
damage than others. A technique has been developed for reliab
evaluating the resistance factor and for determining the effective
of repellents before undertaking large-scale field trials. Studies
direct poisoning techniques involved the evaluation of many diff
ent toxicants, none of which proved entirely satisfactory.

At the Denver Wildlife Research Center, several chemical repelle
were tested and one was found to be effective in reducing dama
to trees by rabbits and meadow mice. A pocket gopher burr
builder, developed in cooperation with the State of Colorado, is n
operational. It constructs an artificial gopher burrow and distribut
lethal baits in one operation.

*Biologists sample waterfowl food plants at the Susquehanna Flats, Md.*

## *W ldlife Diseases and Parasites*

Wildlife disease research in 1959 touched closely on human probl s with the discovery that many English sparrows in Maryland d l from encephalitis, an infection which also produced human fat ties in certain parts of the East. The presence of antibodies to t infection was determined in some blackbirds, starlings, and g ckles, showing that these birds had previously contracted the dis se but recovered.

Study of trichomoniasis, a protozoan-caused throat infection, was c tinued among mourning doves. The same disease was found in t white-winged dove.

## *P ticide-Wildlife Relationships*

In the Southeast, research continued on the effects on wildlife of c orinated hydrocarbons used to eradicate the imported fire ant and r ealed that ground-feeding birds suffered serious losses while tree f ders were little affected. Birds began to repopulate many treated

*A pair of Laysan albatrosses on the hospital lawn at Sand Island, Midwa*

areas by the second year; on small linear tracts, populations of white quail were near normal, but repopulation of larger tracts ceeded more slowly. Spring dieoff of some ground-dwelling b occurred the second year after treatment. While some earthwo were killed by the insecticide, others lived and stored up to 20 parts million of heptachlor epoxide in their tissues within 6 to 10 mo after the ground was treated. Studies of the possible effects of poison on woodcocks which feed on earthworms were intensifie

In the West, studies were started to determine the effects on w life of programs to control grasshoppers, alfalfa weevils, and fo insects. Contamination of lake waters with insecticides at the R Mountain Arsenal was evaluated in relation to duck mortality.

Bureau laboratories have determined the toxicities of many pe cides to various species of wildlife. The results of these studies given in the Bureau's Circular 84, "Annual Review of Pesticide-W life Relationships, 1959."

## *Marine Mammal Research*

In studies of the sea otter at Amchitka, Alaska, and in the east Aleutians, data on populations, food habits, behavior, age and grow pathology, and environment were obtained.

*s of the "blackbird group"—blackbirds, starlings, grackles, and cowbirds—eat contaminate food at livestock feed lots.*

total of 4,382 walruses was counted in aerial surveys made over Bering Sea by Federal and State biologists in February and il when the animals were concentrated at the edge of the retreating ack. Most of these walruses were found about St. Lawrence nd.

## *perative Wildlife Research Units*

hese research units are supported by the cooperative efforts of the eau of Sport Fisheries and Wildlife, the Wildlife Management itute, and the fish and game departments and land-grant colleges niversities of 16 widely separated States. By pooling manpower, ds, technical knowledge, and facilities, results are attained that ne agency could accomplish alone.

uring the calendar year 1959, the units carried on research on 291 jects or subprojects, 222 of which were in wildlife and 69 in fish- subjects. By the end of 1959, they had issued more than 3,000 lications. With last year's 238 graduates, more than 3,200 fish wildlife students had graduated from unit schools. Many earlier duates hold key positions in the wildlife field. Several States le inquiries during the year looking to the establishment of ad- onal units.

## Sport Fishery Research

Findings of a 4-year study of Atlantic salmon in the Shee ot River, Maine, concluded during the year, suggest that restorati of this endangered species in the United States through artificial p a- gation depends on rearing the fish to a much larger size than as heretofore been done. Fish of good quality and sufficient size ny appreciably supplement natural production through better sur al in the rivers or by complete circumvention of river life and atten nt hazards.

Continuing progress was reported by established disease and u- trition laboratories. The development of a microhematocrit techn ue has provided a simple, practical tool for diagnostic examinatio of the blood of wild or hatchery fish. The protozoan parasite, *M o- soma cerebralis*, has been shown to be responsible for the whi g disease, studied since it recently decimated the trout at a S te hatchery.

A previously unknown, virulent, bacterial disease of yellow p h has been shown to be unusually host specific and its potential as - trol agent is under study. A cooperative, controlled, experime al operation of the Coleman National Fish Hatchery is underway to - point the source and prophylaxis of a virus epidemic of juve e chinook salmon. Influences of other dietary factors upon establis d vitamin requirements have been demonstrated. Use of radioac e isotopes provided information on the major role of absorption in e mineral metabolism of fish.

Improved research facilities were provided during the year for disease and fish-management research and for in-service trainin fish culturists. A new fish cultural laboratory was opened at National Fish Hatchery at Marion, Ala., and staffed for researc bass and catfish propagation requirements. The basic and app i studies on the endocrinology of these fish are expected to lead to p tical techniques useful in fish culture of other important specie well.

### Fish Farm Experimental Station

Design of laboratory and combination buildings for the new F s Farming Experimental Station in Arkansas was completed an construction contract awarded. The main building will cont chemistry, biology, and pathology laboratories, other small labo tories for special projects, and library, photographic, and stor g facilities. The combination building includes shop, automotive st feed room, and fish-holding tanks. Experimental ponds of dif- sizes are scheduled for construction.

udies of the effect of heptachlor on fish were begun in Florida ecember to provide data from actual fire ant control operations. ers exposed to the spray were examined before and after spraying. ples of water, aquatic vegetation, and bottom mud were collected hemical analyses to relate the accumulation of heptachlor in those erials with fish losses. Two weeks after treatment with one- ter pound of granular heptachlor per acre, heavy mortality ng bluegill sunfish was observed, and some losses of bass. These es are particularly significant in view of the low-dosage rate ap- d here as compared with the 2 pounds per acre used a year ago in control program. Other pesticides studied included endrin, al- , DDT, and toxaphene.

he first full year of year-round trout fishing on four experimental ams under observation by the Bureau in the Great Smoky Moun- s National Park was completed in 1960. These waters are desig- d as "fishing-for-fun" streams and only trophy-size trout more 16 inches long may be retained. These easy-access streams, ect to heavy fishing pressure, are providing exceedingly fine recre- nal fishing; catch rates ranged from 5 to 8 trout per hour of ing.

udies of a little-known fish, the stoneroller, in Great Smoky ional Park revealed that it ranges up to 9,500 fish per acre of am and competes with rainbow trout for spawning grounds. There ttle doubt that the large numbers of stonerollers are responsible poor spawning success of trout in many miles of trout water. erollers are subject to at least occasional heavy dieoffs resulting n columnaris disease; one such mortality was observed in Little er in the Park last year.

### *ut Facilities Enlarged*

he Convict Creek experimental trout station on the eastern slope he High Sierras in California, at an altitude of more than 7,000 , was enlarged to provide an all-weather laboratory and housing prefabricated steel structures. A mile-long, four-section experi- ital stream area was used for a variety of studies on the survival vitality of wild and hatchery trout. Objectives of the research to establish criteria of postplanting survival quality in hatchery- ed, catchable-size trout to provide for early recognition in the chery of conditions which may lead to poor survival in the wild, to correct these conditions.

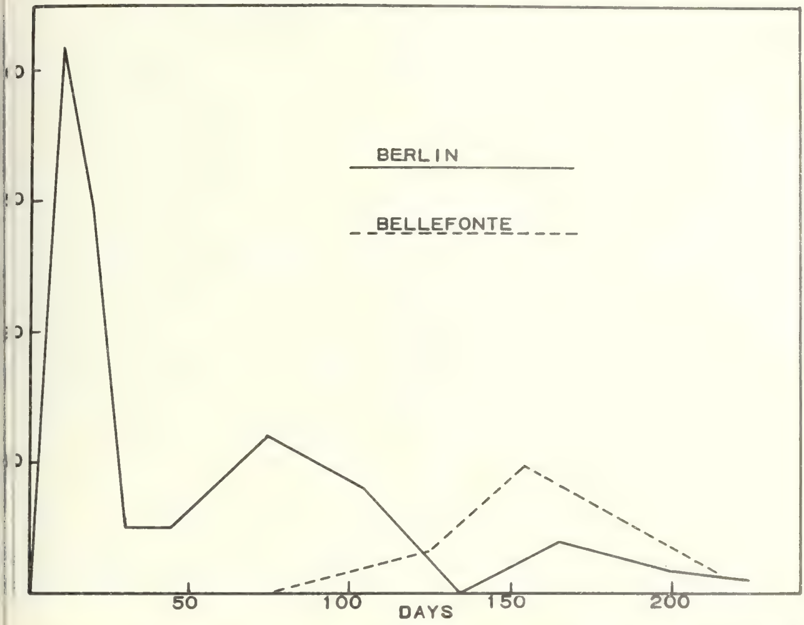
*Convict Creek, Calif., experimental stream area showing middle-water control screen structure. The four sections may be individually dewatered for popula and survival counts.*

With the appearance of drug-resistant strains of fish disease orga isms, Bureau researchers have given more attention recently to findi strains of fish resistant to certain diseases that cause extensive hatche losses from time to time. In a series of experiments with strains brook trout from several eastern Federal and State hatcheries, resi ance to ulcer disease and furunculosis was studied. In an experime with two strains of brook trout, losses of 86 percent occurred in c strain and only 51 percent in the other.

In a second experiment that used three trout strains, the high resistance was demonstrated in Maryland trout from Beaver Cre Hatchery, intermediate resistance in the Pennsylvania strain (Bel fonte Hatchery), and lowest in the New Hampshire strain (Ber Hatchery).

It is evident that differences in inherited disease resistance occ and that they are of practical importance. Selective breeding maintain disease-resistant stocks of fish is necessary to make use application of this finding.

Technical papers were published during the year on a variety subjects relating to fish management, diagnosis and control of fi diseases, nutritional requirements and feeding of fish, and fish cultu methods. Quarterly research progress reports were distributed with the Bureau and to State conservation agencies and other cooperato



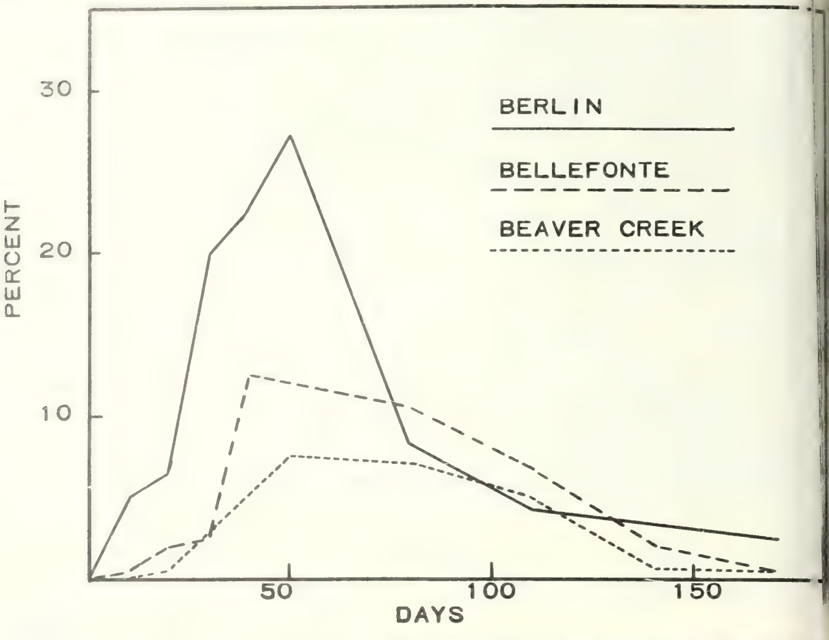
*r disease mortality rates of two strains of brook trout. Berlin hatchery fish far less resistant to the disease than those from Bellefonte hatchery.*

## *Management Activities*

he National Wildlife Refuge System was enlarged by the purchase ,734 acres of land in 74 separate ownerships, and the reservation 5,095 acres of land by public land orders and transfers.

he Migratory Bird Conservation Commission held one meeting ng the year. It approved the purchase of 7,498 acres, and the of 2,222 acres of land, for a new refuge in Utah, the Ouray Na- al Wildlife Refuge; the lease of 5,532 acres of land for the new panocca National Wildlife Refuge in Arkansas; and the acquisi- of 9,040 additional acres of land for 10 existing national wildlife ges.

ands for two new fish hatcheries in Arizona were acquired by lic land order and lease during the year: The Alchesay National Hatchery of 28.48 acres in Navajo County and the Willow Beach ional Fish Hatchery of 47.81 acres in Mohave County. In addi- , 438 acres of land were acquired for three existing hatcheries, 213 acres of land were added to the fish-research facility in ansas for research in the production of fish on rice-growing areas ng the time the land is not in rice production.



*Mortality rates from ulcer disease and furunculosis in three strains of brook t*
*showing differential resistance to these diseases.*

## *National Wildlife Refuges*

The drought occurring over the Northern Great Plains in 1
demonstrated the value of the national refuges to American wildl
Although major water units were low on many refuges, they c
tinued to provide food and protection for increasing numbers
waterfowl as nearby water areas disappeared. While the numbe
refuge breeding birds increased, the production of young decli
slightly.

Although refuge management emphasizes production of natu
foods, supplemental food must often be grown for migrant and w
tering birds. On refuges with heavy waterfowl concentrations o
depredation potential, the staff farms suitable lands, leaving the c
in the field for wildlife use. Elsewhere, refuge fields are farmed
permit on a share basis. Refuge personnel farmed 40 percent of
nearly 105,000 acres cultivated in 1959. Good management practi
planting of grass-legume mixtures and winter grains, and control
grazing on refuge areas have resulted in better goose-browsing ar
and increased numbers of Canada geese on refuges in all four flywa

Aggravated by prolonged hot weather and low-water levels in T
Lake Sump, botulism again occurred on the Tule Lake Refuge, Ca
Of 100,000 birds using the area, 1,000 became ill and 300 died. Inje

*Lesser snow geese and Ross' geese near Malheur Refuge, Oreg.*

infected birds with botulism antitoxin and supplying them fresh er and food hastened recovery. In an outbreak on the Bear River uge, Utah, losses were relatively light.

## *reational Use*

he nearly 10 million visitors on the national wildlife refuges in ) represent a 9-percent increase over the visitor days of public in 1958. About 32 percent of these were fishermen, 5 percent e hunters, while 63 percent enjoyed wildlife observations, pic- ing, and swimming. Recreation is permitted on designated por- s of 138 of the 275 refuges where such coordinated use can be omplished without defeating the primary objective for which the ge was established.

n order to safeguard range conditions and prevent overgrazing, plus animals from four fenced big-game refuges were donated ological parks or sold to the public for food or display and breed- purposes. Over 300 buffaloes, 100 elk, 110 long-horned cattle, 600 deer were sold in 1959. Two buffaloes were shipped to the nila Zoological Park, Philippines, and two to Trinidad.

n a number of the waterfowl refuges and game ranges the carry- capacity of the habitat and wildlife population was kept in bal- by regulated public hunting and live-trapping programs. In eration with a number of States, many deer, some bighorn sheep, turkeys, and quail were live trapped and transplanted to avail unoccupied ranges.

### *Rare Bird Protection*

The September 1959 count of trumpeter swans in the United St was 681. This number includes 663 swans in the wild with thei young and 18 birds in zoological gardens. Since 1957, seven p of refuge birds have been loaned to American zoos for exhibition p poses. During the year, the Bureau of Sport Fisheries and Wild issued a publication in the North American Fauna series on trumpeter swan.

The Aransas Refuge on the Texas Coast continued to provide wir protection for 33 whooping cranes. This is the entire world popu tion except for 6 held in zoos.

Three new refuges were placed under administration during year: Oak Orchard, N.Y.; Buffalo Lake, Tex.; and Mark Tw along the Mississippi River in Iowa, Illinois, and Missouri.

### *National Fish Hatchery Program*

The national fish hatchery program of the Bureau of Sport Fish ies and Wildlife placed more emphasis on integrating fish product and distribution programs with fishery-management plans for St and Federal areas.

Important phases of the program deal with the rearing of spec difficult to propagate that are needed in fishery management; impr ing fish nutrition and disease control by applying research findi on a production basis; and improving production techniques hatcheries.

Construction of large multiple-purpose dams and reservoirs become very important in the program to provide recreational fish for the Nation's increasing number of anglers. Stocking of tr habitat created in the tailwaters below the dams is creating a sp fishery of amazing proportions that has required new fish hatche and is mainly responsible for the increased national program.

The Congress provided funds to continue construction of new hat eries at Garrison Dam, N. Dak.; Gavins Point, S. Dak.; and Will Beach, Ariz. Funds were provided to initiate construction o new hatchery at Alchesay, Ariz. Also, the Congress provided fu to continue the improvement and expansion of facilities at eight ex ing hatcheries.

The production and distribution of all species from national hat eries in 1959 increased 14 percent, by weight, over any previous ye

*Trumpeter swans on Sod House Spring, Malheur Refuge, Oreg.*

increase was about the same for trout and salmon, and slightly
her for warm-water species.

## *hery Management*

ishery management biologists conducted surveys, evaluated fish-
cking programs on Federal waters, and answered thousands of
uiries on fishery subjects during the year. They also held clinics
pond management and demonstrated new and improved fishing
ipment for stream and pond surveys. The fishery management
vices provided to 166 Federal areas (such as military bases and
ional parks, forests, and wildlife refuges) in 1959 contributed sub-
ntially to the 1.7 million fisherman-days spent in those areas. A
npling survey of farm ponds indicated that 5 million people made
million fishing trips to ponds that had been stocked by the Bureau.
e typical 1-acre farm pond received 64 fishing trips and yielded
fish.

ureau personnel worked closely with State fish and game depart-
nts during the year. Fishery surveys on the upper Mississippi
er were coordinated for the Upper Mississippi River Conservation
mmittee and an information leaflet for use of fishermen on the
ssissippi River above St. Louis was issued. Work of the Steering
nmittee for Roanoke River Studies in North Carolina (under
reau chairmanship) was successfully concluded when recommenda-

tions regarding water-quality standards for oxygen (which e lished an important precedent) and minimum flows were accepte by all Government and private groups concerned.

Indian tribes of the Southwest are showing an increasing int in the successful fishery program underway at Fort Apache R vation, Ariz. Here, a new 250-acre lake built for recreation affo 55,000 fisherman-days its first season and yielded 178,000 t Three other reservoirs were completed on the reservation and sto with trout in the past year. The Apache Reservation is serving model for other Indian reservations in developing their recreati opportunities.

### *River Basin Activities*

In accordance with requirements of the 1958 amendments to Fish and Wildlife Coordination Act, the Bureau's reports on wa use projects have set forth more detailed information than form on fish and wildlife benefits and the measures needed to conserve improve fish and wildlife resources. Bureau representatives testi at Congressional hearings on several proposed Federal reclama projects in support of fish and wildlife facilities and benefit e uations upon which sizable allocations of project costs were ba Typical of these was the Norman project in Oklahoma which authorized with a substantial allocation of project costs to fish wildlife in recognition of the fishing and hunting benefits to provided.

At the request of the Canadian Government, biologists of Bureau of Sport Fisheries and Wildlife, assisted by Provincial b ogists, began a study of the authorized Grand Rapids hydroelect project in Manitoba to determine the effects it may have on fish wildlife and to find means of reducing damages to these resour The project involves 1.5 million acres of land and water and have an impact of major importance on waterfowl, fish, moose, a fur-animal habitats.

At the request of the Senate Select Committee on National Wa Resources, a comprehensive report on "Fish and Wildlife Proble and Recommended Policies in Relation to the National Water sources Program" was prepared and published in cooperation with Bureau of Commercial Fisheries. The report points out proble stemming from Federal water and related land-use programs a suggests ways to achieve more adequate recognition of fish and wi life resources.

The financing of detailed studies by the Bureau on water-use pr ects of the U.S. Army Corps of Engineers and the Departmen Bureau of Reclamation was materially strengthened by inclusion

*School children tour the Guttenberg Hatchery and Aquarium in Iowa.*

nds as specific items in Public Works Appropriation Acts for 1960 l 1961 to "provide that wildlife conservation shall receive equal nsideration and be coordinated with other features of water-resource elopment programs."

## ntrolling Harmful Birds and Mammals

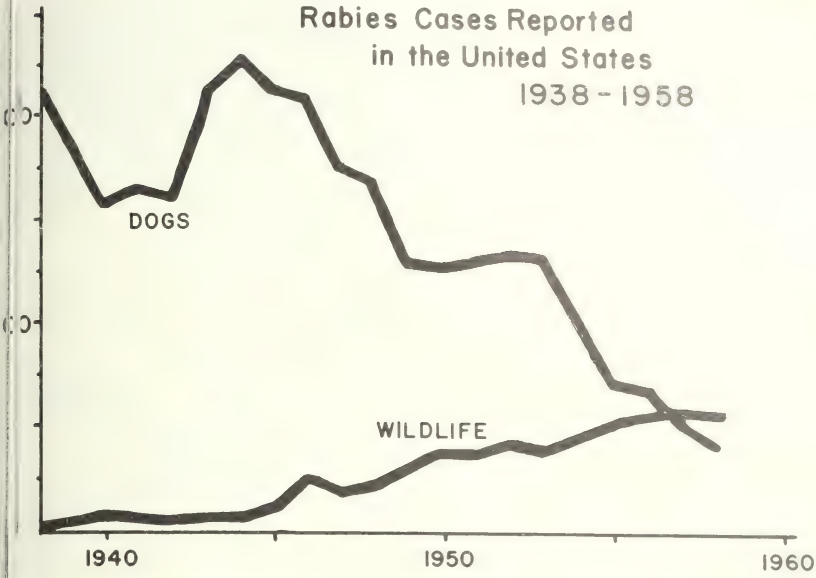
The Bureau completed 45 years of successful partnership with agri- ture and industry in cooperative programs to minimize damage and ease transmission by wildlife. Human demands have brought in- asing problems of coexistence with wildlife, since wildlife species, , have their "population explosions." The primary object of con- l work is to maintain a level at which man and wild animals can e compatibly.

During the year, the Bureau in cooperation with State and other encies treated 4,962,000 acres to control rodent depredations. By ncentrating control efforts, livestock losses from predation were held a low level despite increases in both predator populations and man activity. Special safety precautions were used to prevent jury to humans, pets, and domestic animals from control operations. Improved aerial seeding practices using Bureau-developed repel- nts and control techniques have greatly benefited agriculture and

*Sheep-killing bobcat treed by a dog.*

industry. Savings of $18 to $20 an acre have resulted from contr of seed-eating mice in reforestation projects. Significant progre has also been made in the Clean Grain Program in cooperation w other Federal and State agencies.

Modern methods of intensive agricultural practices with high yie per acre are sometimes accompanied by startling economic losses fr wildlife depredations. A commercial rose grower in Arizona l $75,000 worth of roses on 20 acres when cotton rats invaded his property. Proper treatment promptly stopped further damage. Grow of ornamental plants and operators of feed lots were plagued increasingly vast flocks of starlings. These birds consumed 6 tons cattle feed in 6 hours in one feed yard in November 1959.



*le the incidence of rabies in dogs has shown dramatic improvement due to oved vaccination techniques, wildlife cases have increased alarmingly and account for the majority of reported cases.*

abies in wildlife species, particularly foxes and skunks, has been onsible for losses in livestock and to many people needing to ergo antirabies treatment. A substantial reduction in the incice of the disease was accomplished in some local areas through t efforts of the Bureau and its cooperators to reduce the numbers infected wildlife vectors, halting transmission from animal to nal.

echniques for controlling depredations of nuisance wild animals birds were demonstrated to many groups of farmers, fruit grownurserymen, and agricultural students. Specialized training rses were held for personnel of State, local, and other Federal ncies, and radio and television broadcasts on control methods were de in cooperation with State extension services. The Bureau's ies and rodent-control exhibits were displayed at State fairs, and ny sets of colored slides illustrating identification and control of mal damage were widely distributed.

## *etland Preservation Activities*

he Bureau is cooperating with agricultural agencies in an attempt educe losses of valuable wetland habitat through subsidized drainin the prairie pothole States of Minnesota, North Dakota, and th Dakota.

*Small marsh impoundments such as this provide increased fishing opportunity u stabilized water levels create better waterfowl nesting areas.*

*Application of a fish toxicant, rotenone, from an airboat. This is an effect management practice for restoring good fishing.*

*l-deficient deer winter ranges are revegetated through plantings of bitterbrush, eferred browse species.*

Jnder an agreement of May 2, 1960, county agricultural committees . field officers of the Soil Conservation Service in selected counties l provide the Bureau with information on applications for inage assistance.

'he Bureau will inspect the wetlands involved and advise the agriural agencies of their wildlife values. The Bureau will also diss with the landowners the opportunities for selling or leasing the as under the Bureau's small-wetlands acquisition program. Where dlife values are high, it is hoped that Federal aid and technical stance for drainage will be withheld.

## *iterfowl Management and Protection*

ıs in the past, the Bureau met its continuing responsibility under Migratory Bird Treaty Act to obtain information on the status l distribution of North American waterfowl. The following ual surveys were made:

A January survey of continental wintering areas to determine distribution and relative numbers of birds after the close of iting.

- A survey of hunters immediately following the hunting seas to measure size of the kill and effects of hunting regulations on h er activity and kill.
- A survey of the major continental breeding areas during y, June, July, and August to measure size and distribution o he breeding populations and number of young produced.

Efforts were adjusted wherever possible to give all possible pr c-tion to diving ducks while, at the same time, undercover activities re continued by game management agents to curb market hunting d other commercial-type violations. These efforts resulted in the ap e-hension and prosecution of additional market hunters, including s-eral repeaters along the Eastern Shore of Maryland and Virg a where an outbreak of trapping with the use of numerous small t s occurred.

Violations of fish and wildlife conservation laws administere y the Bureau of Sport Fisheries and Wildlife during fiscal years 9 and 1960 are compared in the following table:

| | Cases pending beginning fiscal year | New cases | Cases terminated | Cases pending end fiscal year | Fines and costs | Ja sent (da |
|---|---|---|---|---|---|---|
| Fiscal year 1959 | 859 | 4, 215 | 4, 556 | 518 | $182, 828. 85 | 7 3 5 |
| Fiscal year 1960 | 485 | 4, 808 | 4, 576 | 717 | 158, 170. 27 | 5 3 |

## *Federal Aid in Sport-Fish Restoration*

In 1960, Federal funds totaling $5,300,000 were apportioned am the States and island possessions for research, land acquisit and other activities concerned with sport-fish restoration.

As in the past, land acquisition in fiscal year 1960 was an portant phase of State programs. Development of public fish areas by providing roads, parking areas, and boat-launching ran and the creation of new public fishing lakes will ensure anglers pla to fish in future years. Development of these public fishing are control of rough fish and undesirable aquatics to improve sport fish in existing waters, and installation of stream-improvement structu have a significant place in the States' sport-fish restoration progra

Coastal States continue to show increasing interest in their mar fisheries. Creel censuses are being made, life history studies of flu striped bass, white sea bass, and barracuda are underway, and t value of artificial reefs in improving the habitat for salt water ga fish is being assessed.

The small but steady increase in salaries of biologists employ under the Federal aid program has helped the States attract a hold qualified personnel. Several States have made cooperati agreements with State colleges for statistical services to improve t

*F l-border plantings of lespedezas furnish both food and shelter for small game. M y States are using this habitat improvement measure.*

d gn of their projects and to increase the reliability of the project fi ings and conclusions.

## *F leral Aid in Wildlife Restoration*

he States and island possessions were apportioned $15,312,778 in 1 ) for their Federal aid in wildlife restoration programs.

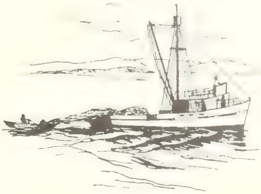
esearch by the States included the collection of data on breeding s ess, population numbers, and hunting take for all game species t erve as a basis for setting hunting seasons and bag limits. The r ılts of this research have been widely disseminated through the is ance of 363 State publications.

Iunting areas available to the general public are gradually shrink- i while hunters are increasing in numbers. This problem is being m by the acquiring of lands for public hunting and refuge purposes t preserve as much land under State control as possible. Acquiring v lands for waterfowl and winter ranges for big game are the p nary objectives of the States' land-acquisition program.

he States have given particular attention to wildlife manage- m it and habitat improvement, mainly on acquired lands. They are i proving and creating desirable wildlife habitat by creating clear- i s in dense cover, planting areas to wildlife food crops, and re- s ring cover and creating water areas where needed. Access roads a l minimum public-use facilities help assure maximum public use of t se managed areas.

# ureau of Commercial Fisheries

**onald L. McKernan,** ***Director***

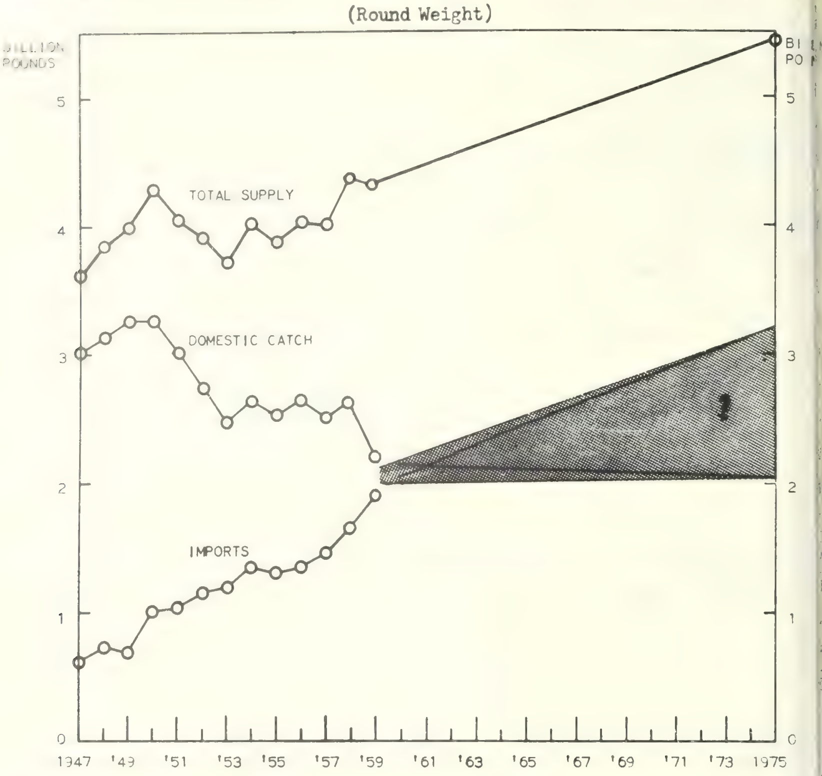


**IE UNITED STATES** catch of fish and shellfish in 1959 was 5.1 lion pounds, or 152 million pounds less than the record catch of 56. The total value of the catch was $342 million, or $31 million s than in the previous year and $11 million less than the previous year average. For the first time, the catch of fish for industrial rposes exceeded the catch for human consumption.

Per capita consumption of fishery products remained static at 10.7 unds. The increased supply required for our growing population ne from imports which reached an all-time high of 1.9 billion unds of edible fishery products and 1.3 billion pounds of nonedible. reign fishermen supplied more than 45 percent of the food fishery oducts used in the United States in 1959.

n this background, the Bureau of Commercial Fisheries has rked, during the past year, to fulfill its twofold continuing pro- am: Strengthening a troubled fishing industry in the public in- est and conserving and managing the natural resource upon which industry depends. Attention has been focused on the economics the domestic fishery and the problems created by a vigorous and owing foreign competition. Through membership and active par- ipation in eight international fishery commissions, consultation and vice on trade and tariff agreements, assembling and analyzing rldwide information on developments in foreign fisheries, and ough reports to the Congress and the public on special industry dies, services were provided the domestic fisheries that helped stabilize trade and promote profitable fishery production and rketing.

Material advances in fishery science, technology, and administration ve been made during the past year, and the progress continues. The



*The Nation's supply of edible fishery products, 1947–59, and estimated req ments, 1960–75. Can the domestic catch supply food for our growing popul or will a still greater share come from imports?*

following highlights of the year are only examples of indivi projects which have reached virtual completion with substan accomplishment.

- A successful means of killing pests and predators on oyster b has been found, and it is being evaluated for wide application oyster farmers.
- A successful chemical lampricide for controlling the sea lamp has been applied to all but 11 streams tributary to Lake Superior treatment of streams tributary to Lake Michigan is under way.
- Studies on protection and restoration of the Atlantic shad fish have been substantially completed and recommendations for man ment have been made to the Atlantic States Marine Fisheries C mission and to the member States.
- Exploratory and experimental fishing by Bureau vessels h revealed new resources of commercial value in various offshore are bottom fish off Washington, scallops off the east coast of Florida, h

ns off North Carolina, and trawlable stocks of virtually unused es in the Great Lakes.

Technological studies on fishery byproducts have revealed in fish highly unsaturated fatty acids that are effective in reducing od-cholesterol levels in animals and, hence, have probable value pharmaceutical applications; and they have discovered valuable wth factors in fishmeal, an effective and economical supplement in ltry and stock feed.

Rapid progress has been made in developing quality standards fishery products and in implementing the system of voluntary ernment inspection at industry expense. Thirty-six fish-process- plants are under continuous inspection requiring 44 U.S. Depart- it of the Interior inspectors. This program will contribute ma- ally toward maintaining the quality of fishery products and ancing their popularity.

he activities of the Bureau of Commercial Fisheries are organized major geographic areas of the United States (including Alaska Hawaii) so as to bring to bear upon the difficulties and problems producers, distributors, and consumers the combined knowledge skill of the Bureau's experts. Bureau activities for the year are efly recounted.

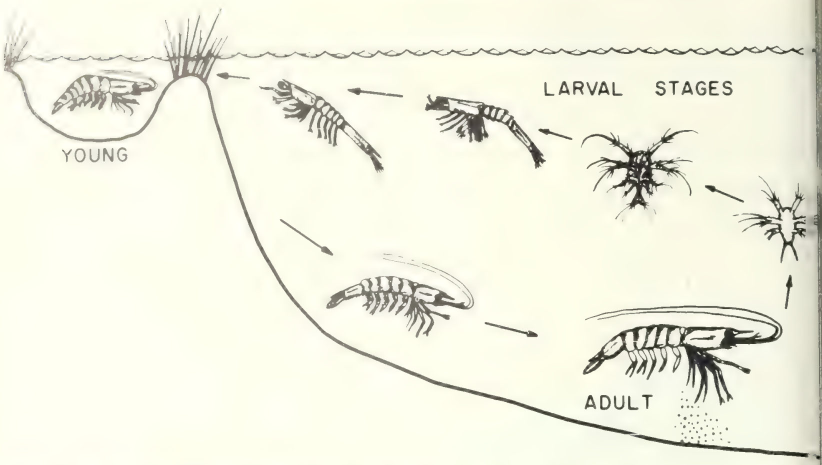
## *Biological Research*

esearch on the marine fishery resources of our coastal and offshore ers has continued in order to meet many problems of the fishing ustry, particularly determining future supplies and understanding changes in fishing effort or in the natural environment affect ribution and abundance. Engineering projects that modify the stal environment also received special attention.

tudies on the proposed Passamaquoddy Bay project in Maine in tion to the herring stocks and other fisheries were completed with conclusion that power dams across the mouth of the bay probably ld have slight effect on the fisheries in the area.

long the Atlantic and Gulf coasts investigations were commenced letermine how dredging of channels, reclamation of land, or the roduction of insecticidal and pesticidal chemicals influence the vival of young fish and shellfish. Chlorinated hydrocarbons, in es as low as 5 parts per billion, in the Gulf of Mexico, were found ic to shrimp larvae.

he superabundance of the 1958 year brood of the Atlantic men- len has been observed in catches during 1959 and 1960. The aver- size in this group is small compared with those of other years,



*Life cycle of shrimp. Spawned in the ocean, the larvae (here greatly magni*
*migrate to inshore nursery areas. As the shrimp grow, they return to sea w*
***they support the most valuable of our commercial fisheries.***

but total numbers are high and promise to support the fishery v
in 1960 and later years.

Haddock of the 1958 year brood are also abundant and have b
receiving conservation protection from larger meshes in the nets wh
have been introduced through international regulations.

The larvae and young of brown and white shrimp from the G
of Mexico were described, following successful experiments to spa
and grow the young in laboratory aquariums. This information
the early life stages will aid identification of these species taken
collections at sea and subsequent definition of life cycles and mo
ments to and from nursery grounds. Varying temperatures in
inside waters of Galveston Bay were shown to control the entra
of small shrimp to the nursery grounds and their departure to en
the fishery.

Oceanic conditions along the Pacific coast gradually returned
normal after a period of very warm water since 1957. The Pac
sardine shifted somewhat to the south, when its distribution in 1
was compared with that of previous years, and catches were best
northern Baja California, although its total abundance was not hi
there or elsewhere in the fishery. Serological research gave str
evidence that northern and southern populations are genetica
distinct.

Opportunities for research on the behavior of tunas in the cent
and eastern Pacific were greatly improved when the *Charles H. G*
*bert* was modified by the addition of bow chambers for direct obs
vation of the fish under water. It was learned that tuna are th

*ew sight for fisherman and scientists. A school of tuna seen from the observa- chamber of the "Charles H. Gilbert".*

ghtened by noise or fish blood in the water as fisherman and scien- s have believed for many years. Various kinds of new baits ve been tested to improve tuna-fishing efficiency.

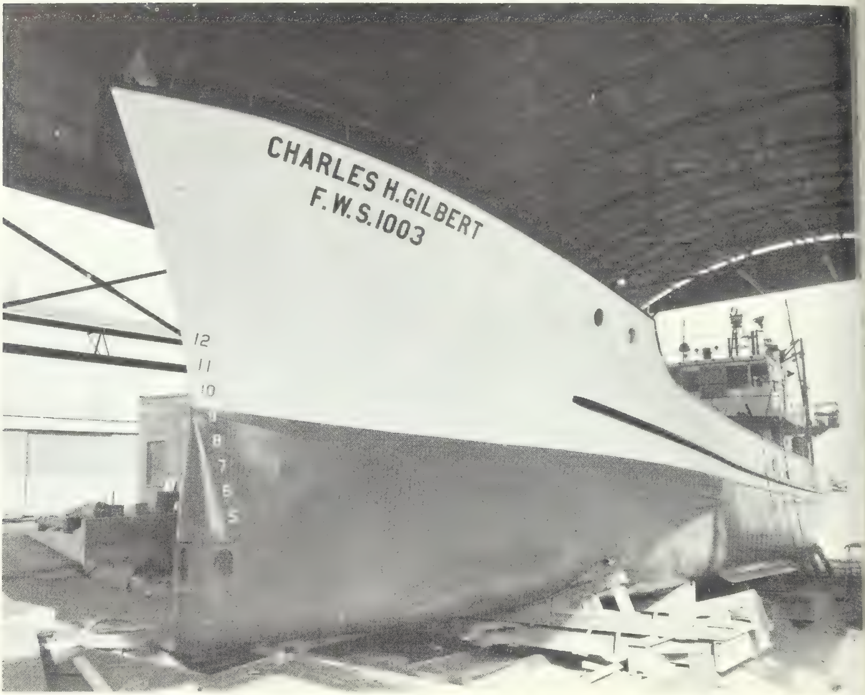
Studies of oceanography received national attention particularly as esult of reports released by the National Academy of Sciences and tional Research Council on the need for increased research in this d. The Bureau's program of fishery oceanographic research is ng coordinated with oceanographic researches of other agencies, h as the U.S. Navy, U.S. Coast and Geodetic Survey, the Na- nal Science Foundation, and the Atomic Energy Commission, to ain maximum benefit from the vessels and scientific personnel en- ged in marine research.

A modern three-story research laboratory and office building was npleted at Woods Hole, Mass., and occupied by the staff of the reau's Biological Laboratory during 1960.

## *ellfisheries*

Research on commercial shellfish seeks to increase production by ntrolling predators and disease, providing a more favorable en- onment, and improving cultural methods.

Predators and competitors are the principal cause of loss in oysters l clams. The Milford (Connecticut) Biological Laboratory some ne ago began routine testing of various chemicals to find a poison t would kill oyster drills, starfish, and other enemies, or prevent ir invasion of oyster beds. Of the nearly 5,000 chemicals screened,



*Construction of the underwater observation chamber on the bow of the "Charles H. Gilbert".*

about 100 were found to be poisonous to shellfish predators but harmless to desirable fish and shellfish. During the past year, field tests were begun to determine effectiveness of some of these chemicals, to develop methods for their practical use, and to study harmful effects.

Sand treated with chemicals was found to be efficient in holding poison on the bottom. A ridge of treated sand 18 inches wide and a few inches deep was placed around an oyster bed in Long Island Sound, and dead and dying drills were found on and near the barrier. The chemicals were still poisonous to drills 9 months later. Treated sand spread over the oyster bed was effective in killing drills already in the area with no harm to the oysters.

These experiments indicate that chemicals are possibilities for predator control, but further testing in laboratory and field is needed before any chemical can be recommended to the industry.

In 1957, the oysters of Delaware Bay were subjected to a sudden and severe mortality, and an estimated 70 percent of them died. Losses have continued in 1958 and 1959. Oyster losses of a similar type were first observed in lower Chesapeake Bay in 1959. Cooperative studies between the Bureau laboratory at Annapolis, Md., and the

States of New Jersey, Delaware, Maryland, and Virginia are underway to find the cause of the mass mortalities.

An organism similar to a fungus, found in gaping and dead oysters, is the most likely suspect in the oyster losses. Research is concerned with routine sampling to follow the spread of the deaths, and field and laboratory experiments to attempt cross infection and to study the life history of the suspected organism are under way. Some oysters have been found in Delaware Bay that survived the mortality. Survival of these oysters may indicate resistance to a casual organism and suggests the possibility of breeding oysters that are immune. Selective breeding studies will begin shortly.

### *Inland Fisheries*

Measures being used to control predatory sea lampreys in the Great Lakes are bringing results. In streams tributary to Lake Superior, the numbers of spawning lampreys trapped at electrical barrier sites declined during the past year. More than 20 lamprey-infested streams were treated with a chemical lampricide that kills all generations of developing lamprey larvae buried in the streambed with no appreciable damage to valuable fish. Only six infested streams on the United States shore and five on the Canadian shore remain to be treated. Chemical treatment of streams tributary to Lake Michigan also is underway.

More than 50 electrical barriers were maintained on Lakes Superior and Michigan to prevent reinfestation of treated streams by lampreys and to provide an assessment of their abundance. Thousands of spawning lampreys were killed at the electrical barrier sites.

Biologists working in Lake Erie found that major changes have occurred there in water chemistry, fish-food organisms, and fish fauna since a 1930 survey of the lake. Blue pike and cisco, which formerly comprised the bulk of the commercial catch, have almost disappeared; but smelt, alewife, gizzard shad, and yellow perch are more plentiful than in earlier years. The change seems to have resulted from an increase in water temperatures and in nutrients added to the water by industrialization and population expansion.

In Lake Superior, spawning stocks of lake trout continue to decline; however, it is believed that a sufficiently large brood stock will be available in the lake by the time the sea lamprey population is reduced through control measures now being used. Research in Lake Michigan is directed toward measuring changes in the species of chub and in the size composition and abundance of chub stocks. Preliminary results show an increase over survey estimates of 1954–55 in the abundance of bloater chubs, which offers a promising source of industrial fish.

### *Anadromous Fisheries*

Since anadromous fishes spawn in fresh water but live and grow in salt water, research on these fishes is spread over two very different environments. For the most part, the fresh water phase of the life history has been emphasized, as it seems to be the critical period influencing future production. Research has been directed toward determining the factors that influence production and developing methods to augment survival.

In 1949, the Atlantic States Marine Fisheries Commission requested the Fish and Wildlife Service to study shad to determine the cause of the decline in the Atlantic coast runs and to provide basic information for improving management of the fishery. The Bureau has completed a large part of this work, and scientists found that water quality, overfishing, and stream barriers were the major factors in the decline in runs. The research findings have been reported in 31 scientific papers, and more papers will be issued in the near future.

During March 1960, scientists from the Bureau and from the States of Maryland and Virginia tagged 2,000 striped bass in the Potomac River. Returns of tagged fish now coming in will provide information on the annual and seasonal migrations, mortality rates, and size of the population in the river. Of 1,400 striped bass tagged in the Potomac last fall, 10 percent have been recovered. These recoveries show a general movement of striped bass from the lower and upper sections of the river to the central section during the fall months.

Research was expanded on the blue crab of the Atlantic coast to determine the cause of the great annual fluctuations in their numbers. Research contracts let to the Oyster Institute of North America and Duke University show promise of determining the factors that influence the survival and growth of early larval stages. Recoveries of commercial-size blue crabs tagged during August 1959 in Charleston Harbor and in the North Edisto River estuary of South Carolina show no long migrations from the tagging sites. The two populations appear to be distinct.

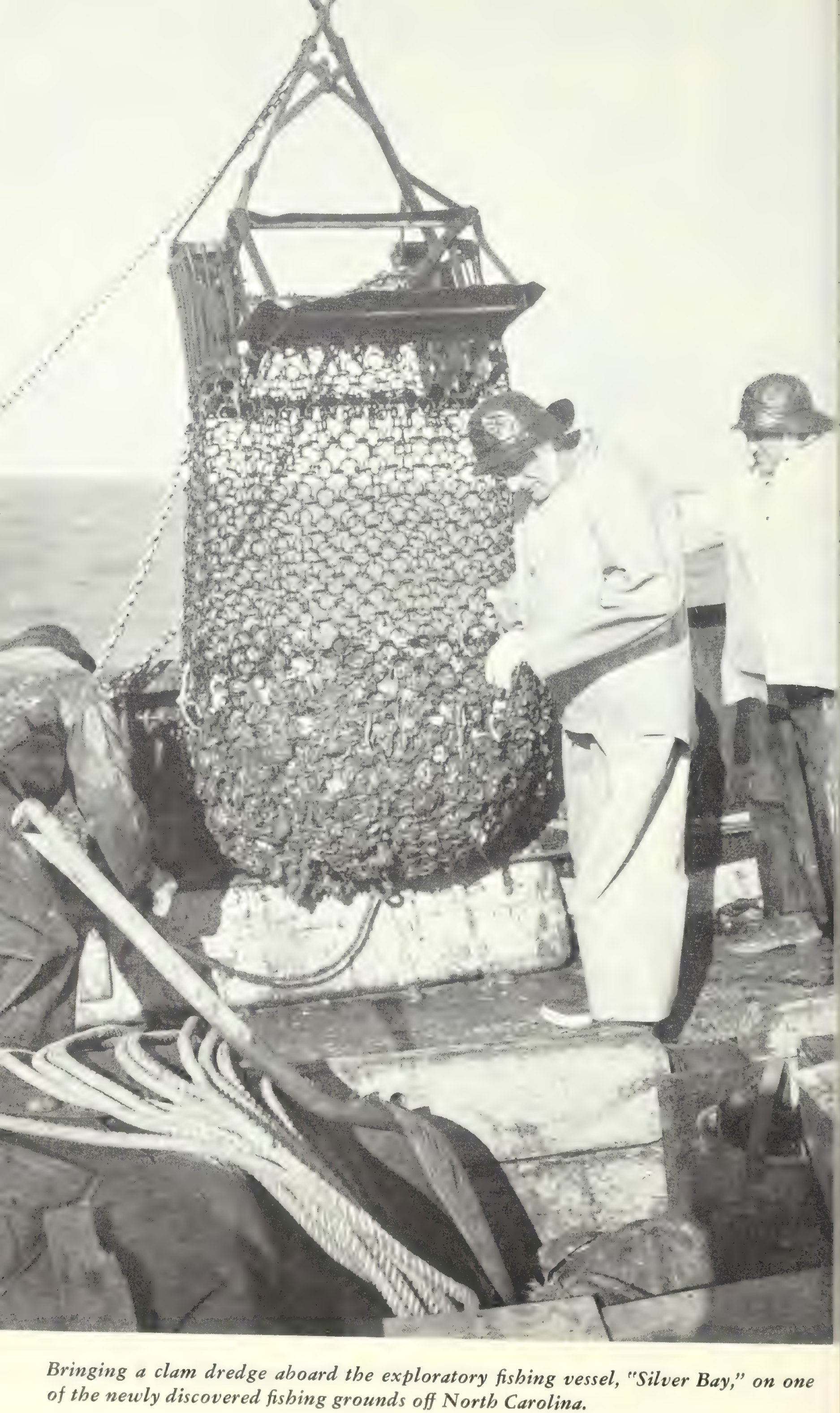
Much progress has been made on research for the International North Pacific Fisheries Commission. As certain physical characters of salmon vary by area of origin, it is now possible to identify, with almost 80-percent accuracy, the continental origin of red salmon taken on the high seas in the North Pacific. Scale characteristics and serological methods also are used to separate salmon populations. A large-scale tagging program in the North Pacific is providing detailed information on the extent of intermingling of Asiatic and American stocks—facts vital to international management and protection of the resource.

*Testing the 6-pool prototype of the fishway designed for Ice Harbor Dam. The "steps" in this "stairway" are 1 foot high and 10 feet long.*

Oceanographic studies in the North Pacific show that the southern limit of salmon in the summer is largely determined by the position of the polar front. Greater experimental catches of salmon, particularly of red salmon, were made from the Aleutian (cold) Current than from adjacent areas.

Fish-passage tests are being conducted at the Fisheries Engineering Research Facility, Bonneville Dam, to evaluate the effectiveness of a 1-on-10-slope prototype fishway of a type authorized for construction at Ice Harbor Dam. The rate of fish passage is determined by observing the fish as they enter the fishway and as they pass over the weir crests or through submerged orifices. An underwater viewing chamber, located adjacent to the uppermost submerged orifice, is used to record fish passing through the orifices. Results to date show that this fishway, while less expensive to construct than the 1-on-16-slope fishway, is passing fish just as effectively.

Through measurements of the blood-lactate levels of salmonids following lengthy ascents in an endless experimental fishway, scien-



*Bringing a clam dredge aboard the exploratory fishing vessel, "Silver Bay," on one of the newly discovered fishing grounds off North Carolina.*

tists found that salmon do not become excessively fatigued after ascending such heights as 1,000 feet, and fish have been observed to climb vertical distances of more than a mile in more than 5 days.

By use of sonic fish tags, movements of salmon in the Columbia River have been recorded in great detail. Sonic tags have been reduced in size and improved over earlier models so that fish bearing such tags can be detected over longer periods of time, at greater distances, and with less interference. This novel device is providing a great deal of information on the migration pattern and the behavior of salmon.

With the transfer of fishery management responsibilities to the State of Alaska, the research program was redirected into more basic studies such as measurement of the effect of environmental factors on the survival of pink and red salmon. Several methods for measuring the survival of pink salmon were tested and evaluated. In samples of adult chum salmon taken from a number of areas in Alaska, the size and age composition were found to vary widely by area. Divers working in western Alaska lakes were able to learn much about the habits of juvenile red salmon and predator and competitor species.

### *Marine Mammals*

Research on marine mammals was directed primarily to the fur seal and gray whale. The annual census of the gray whale, taken on its migration route along the coast of California, places the present population at about 6,000 animals—a definite recovery from near extinction.

A study of the food habits of fur seals collected in the Pacific Ocean show a variable diet of anchovies, hake, rockfish, squid, saury, sablefish, herring, and salmon. On the Pribilof Islands, research was conducted on the causes of the periodic high losses of newborn fur seal pups and on methods of assessing the size of the Pribilof herd.

## *Industrial Research*

Exploratory trawling operations for bottom fish by the *John N. Cobb* off Cape Flattery, Wash., resulted in the discovery of a considerable area of clear dragging bottom inhabited by commercial quantities of petrale sole, Dover sole, and Pacific ocean perch. This discovery has provided a new fishing area for the Pacific Northwest trawl fleet and the area is being actively fished.

Explorations in the Chukchi Sea, undertaken in cooperation with the U.S. Atomic Energy Commission, provided valuable information on the marine fauna of the area. During April, concentrations of yellowfin tuna were discovered in the Gulf Stream area of the western North Atlantic by the exploratory fishing vessel *Delaware.* Explorations of the vessel, *Silver Bay*, off the Middle and South Atlantic States revealed the existence of commercial concentrations of calico scallops over a 1,200-square-mile area between Daytona Beach and Fort Pierce, Fla.

Based on information obtained through Bureau exploratory fishing operations, over 900,000 pounds of hard clams were produced in a 2-month period by commercial vessels from grounds off Beaufort, N.C. Experimental fishing with Gulf of Mexico-type trawls in Lake Erie revealed that commercial quantities of smelt can be taken with this type of gear during the summer and early fall.

Experimental midwater trawling by the Bureau's vessel, *Oregon*, has indicated that midwater trawls hold considerable promise for efficient harvesting of midwater-schooling fish in the Gulf of Mexico. Testing of an electroguidance unit, in conjunction with conventional gear used to catch herring (Maine sardines), indicated the need of a unit with greater power. Such a unit has been constructed by private industry and will be used in future experiments.

Through the use of underwater motion picture cameras, diving sleds, and diving equipment, gear specialists obtained considerable information on the performance of shrimp trawls in action. By observing the trawls at work, new and modified trawl designs and operational methods can be developed on a rational and scientific basis.

## *Technological Advances*

The new Technological Laboratory in Gloucester, Mass., dedicated during the past year, is specializing in problems associated with the refrigeration of fish. The most modern refrigeration equipment has been installed for research that will benefit the fishing industry of the entire country.

The research program on fish oils resulted in a significant breakthrough in the pharmaceutical field during the year. Fish oils, which form a rich source of highly unsaturated fatty acids, were found to be highly effective in reducing blood-cholesterol levels in laboratory animals. These studies demonstrated that fish-oil fatty acids are considerably more effective in reducing blood-cholesterol levels than is linoleic acid, a major component of vegetable oils now widely used for treatment of atherosclerosis, a common form of heart disease.

Research on fishmeal and solubles concerned with the nutritional aspects of animal feeding has produced the following important findings:

△ Fish protein in mixed animal feeds increases growth rates approximately 16 percent

*Extraction of oil from tuna meal preparatory to evaluating the protein quality of the meal as chick feed component.*

Δ Fish meal samples show evidence of the presence of valuable, unknown growth factors

Δ Given levels of nutritional values are attained more economically with fish meal than other supplements.

Rapid strides were also made during the year in the Bureau's highly successful standards—development and inspection program. Nine plants were added to those already under continuous inspection, making a total of 36 inspected plants that require 44 U.S. Department of the Interior inspectors. Cost of the inspection service is defrayed by the industry.

*Home economists of the Bureau of Commercial Fisheries demonstrate fish cookery on popular TV homemaker shows.*

The most significant recent advance in the standards-development program was promulgation of a standard for frozen raw headless shrimp, the most valuable product of our domestic fisheries. The standardization, inspection, and certification of raw headless shrimp will be of great importance in maintaining quality and consumer acceptance.

## *Marketing Assistance*

Increasing competition from other protein foods and an unusual abundance of certain important fish species in excess of existing demand have caused a number of serious marketing difficulties during the past year.

In meeting its responsibility to the fishing industry, the Bureau cooperated in market promotion of slow-moving fishery products. Recorded radio announcements dealing with the nutritional value of fishery products were distributed to virtually every radio station in the country. Educational materials, recipes, and food photos were made available to newspaper food editors, cooperating radio and television personalities, and the mass-feeding industry.

A new feature of the promotion effort was the national distribution of public service animated television "spots," dealing with the nutritional value of fishery products and the Department's standards and inspection program. Two of the four "spots" developed by the

Bureau were among the winners in the first American TV Commercials Festival and Forum.

Bureau home economists presented 240 cookery demonstrations for school lunch and other institutional supervisory personnel, appeared on 36 television and radio food shows, participated in five national food trade conventions, and developed and distributed kitchen-tested recipes for institutional and home use.

### *Foreign Trade Problems*

The United States has become the world's largest importer of fishery products, and these increased imports have created many problems for the domestic fishing industry, particularly for tuna, groundfish, shrimp, and fishmeal. At the same time, United States producers have encountered increased competition, and in some cases protectionism, in their efforts to sell United States products, such as fish oils and canned fish, in traditional foreign markets.

Actions initiated through the General Agreement on Tariffs and Trade (GATT) liberalized many foreign import restrictions. During the year, restrictions were lifted on a number of fishery products from the United States and Canada. Preparations were made to participate in the 1960–61 GATT trade-agreement negotiations, and the industry was advised of items scheduled for consideration. A conference was sponsored to obtain industry advice on actions the Government might take to increase the sale of United States fishery products abroad.

The Bureau actively assisted the fishing industry in attempting to solve trade and tariff problems created by expanded imports. A "Report to the President and the Congress on Fresh, Frozen, and Processed Shrimp" was prepared at the request of industry. Information was assembled to assist United States domestic fishmeal producers to cope with the adverse market situation that developed during 1959. Careful study was made of fishmeal production and marketing in other countries and the findings reported to industry.

A government-to-government conference was held in Tokyo, Japan, to discuss the tuna resource and its production and marketing with Japanese fishing interests. The Japanese Government gave assurance that efforts would be made to promote stable development of United States markets. An exchange of scientific and technical information between the two countries was arranged.

### *Economic Studies*

The economic problems of the domestic shrimp industry are associated with the decline in catch per vessel and the increase in imports.

A long-range study was undertaken to analyze the factors that imped or retard productivity and to recommend salutary measures. A crit cal examination is being made of those areas where operationa efficiency is vital to the industry's ability to compete with foreign based industries.

In other segments of the fishing industry, economic studies wit particular emphasis on costs of fishing operations have been com pleted or are nearly completed. A report on costs in the albacor industry in relation to areas fished, type of vessels employed, an other factors of special significance in determining the competitiv status of the industry was submitted. A similar report, under re search contract, was completed for the New England groundfis industry.

To provide information for the salmon, sardine, and tuna industrie in the field of consumer research, a motivational analysis of consume buying habits for canned fishery products was completed. Studie are in progress on the long-term outlook for the production and consumption of fishery products. Transportation studies and participation in regulatory proceedings led to favorable consideration of rate and services of direct interest to the fishing industry.

Bureau representatives advised and assisted in the organization o four new fishery cooperatives, and provided information and othe services to those in operation. Twenty cooperatives were visited to ensure compliance with the provisions of the Fishery Cooperative Marketing Act of 1934.

### *Resource Development Services*

Management of the commercial fisheries of Alaska by the Bureau of Commercial Fisheries was terminated on December 31, 1959, when this responsibility was assumed by the State. The Bureau has worked closely with State officials in the orderly transfer of records and equipment to the State as provided for in the Alaska Statehood Act and the Alaska Omnibus Act.

In 1959, Alaska's fishery products, including fur seal byproducts, had a wholesale value of $72 million as compared with $83 million in the previous year. Department regulations for 1959 prohibited the use of traps, except for 11 floating traps operated by native Indian communities in Southeastern Alaska. Fishing gear utilized in the Alaska salmon industry in 1959 (comparable figures for 1958 in parentheses) were as follows: Traps, 11 (243); purse seines, 904 (1,193); beach seines, 387 (340); gill nets, 4,451 (5,309); salmon troll hooks, 32,326 (32,376); and fish wheels, 8 (5). Sixty-eight salmon canneries were operated in Alaska in 1959 as compared with 78 in 1958.

*A family group of fur seals on a Pribilof Islands rookery. It includes the harem bull, about 24 cows, and some half dozen pups.*

## *Fur Seal Harvest*

The fur seal harvest on the Pribilof Islands in the summer of 1959 amounted to 57,810 skins. Of these, 15 percent were delivered to Canada and 15 percent to Japan under the terms of the Interim Convention on Conservation of North Pacific Fur Seals. During fiscal year 1960, 46,637 skins were sold with gross receipts to the United States Government of $3,185,584. Under the terms of the Alaska Statehood Act, 70 percent of the net proceeds from the sale of sealskins shall be paid to the State of Alaska. The first payment to the State, $813,919, was made on February 4, 1960, for fiscal year 1959.

## *Columbia River Program*

The construction of dams on the Columbia River continued to pose serious problems to the maintenance of the salmon and steelhead resources of that basin. Facilities for handling upstream and downstream migrants are now in operation at several high dams; their success, however, must be measured in terms of returning adults over a period of years.

The Columbia River fishery development program, involving th State fish and game agencies of Washington, Oregon, and Idah and the Department's Fish and Wildlife Service, has continued unde Federal financing. This program includes the operation of hatch eries, screening of diversions, and stream-improvement activities, suc as building fish ladders around falls and removing log jams. Ob jective of the program is the full use for fish production of area still available to salmon and steelhead, to compensate in part fo damages to the fishery resource resulting from the Federal water development program in the Columbia basin.

### *Statistical Surveys and Reports*

During the year, general statistical surveys to obtain detailed dat on employment in the fisheries, number of fishing craft and gea operated, volume and value of the catch, and production of manufactured fishery products for 1958, were completed and publishec for all sections of the United States. Similar surveys were undertaken for 1959, including for the first time detailed data for Hawaii

Monthly bulletins were issued on landings of fish and shellfish in 14 coastal States and Ohio. Publication of monthly landing bulletins for Maryland and Virginia was started during the year. Release of these bulletins was particularly important, since about two-thirds of the domestic catch of oysters and one-half of the catch of blue crabs are taken in these States. Publication of annual bulletins in the Current Fishery Statistics series containing monthly data on the landings of fishery products in Washington, Oregon, and Hawaii, was also undertaken. Monthly data are now available on about 97 percent of the domestic catch.

Monthly reports were issued on freezings and holdings of frozen fish, production of fish meal and oil, and foreign trade in fishery commodities. The quarterly report, containing data on the production of fish sticks and portions, by months, was also issued.

A detailed statistical review of the fisheries of the United States for 1959 was published, and data were assembled on the 1959 catch and production of manufactured products for publication in the Food and Agriculture Organization "Yearbook of Fishery Statistics for 1959" for publication in the 1960 editions of Statistical Abstracts of the United States and Agricultural Statistics of the Departments of Commerce and Agriculture, respectively. Detailed economic and biological data on landings of fish and shellfish in the Northwest Atlantic, of shrimp in the South Atlantic and Gulf area, and the United States catch of fish off foreign coasts were assembled and published.

## *Financial Assistance to the Fisheries*

The Fisheries Loan Fund Program, authorized by the Fish and Wildlife Act of 1956, was continued in fiscal year 1960. Loans were made to finance and refinance the operation, maintenance, repair, and equipping of fishing gear and vessels. Most fishing-vessel owners have been unable to obtain loans from other sources because of the depressed condition of the fishery industry.

During the year, new applications were received for 190 loans, totaling $5,405,446. One hundred and five applications were approved, totaling $2,220,024; 65 totaling $1,927,302 were declined or found to be ineligible; and 24 were withdrawn before final decisions were reached. At the beginning of the year the backlog of cases being processed or deferred at the request of applicants was 26; at the end of the year it was 22. The 1959 catch of the vessels receiving loans from this program totaled about 190 million pounds. Collections of principal and interest during the year amounted to $1,015,300.

## *Market Information*

From the market information furnished the fishing industry by the Bureau's daily Fishery Products Reports, members of the industry can estimate the current market for fresh, frozen, and canned ishery products. These daily reports are issued by seven Market News Service offices, located at Boston, New York City, Hampton, Va., (including data from Baltimore, Md.), New Orleans, San Pedro, Calif. (including data from Astoria, Oreg.), Seattle, and Chicago. The Reports supply information on landings, receipts, stocks, imports and exports, market conditions, and prices for all types of fishery products. They also contain news on developments in United States and foreign fisheries. Increased coverage of prices and market conditions has been a material aid in the orderly marketing of fishery products.

A special report, reviewing the trends and developments in shrimp marketing at Chicago over a period of years, has been issued by the Chicago Market News Service office. Statistical data, covering a 10-year period, on cold-storage holdings of shrimp, United States landings by areas, imports, availabilty and disposition of shrimp supplies, and related data, are also shown.

The monthly periodical, Commercial Fisheries Review, continues to feature articles and news of trends and developments in the domestic and foreign fisheries.

# Office of the Administrative Assistant Secretary

D. Otis Beasley, *Administrative Assistant Secretary*

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THE ADMINISTRATIVE ASSISTANT SECRETARY discharges the duties of the Secretary with respect to administrative management. The Office of the Administrative Assistant Secretary consists of seven staff divisions: Administrative Services, Budget and Finance, Inspection, Management Research, Personnel Management, Property Management, and Security.

Each of these divisions is responsible for its designated function for the Department of the Interior and represents the Department before other agencies of the Federal Government which have governmentwide responsibility for like administrative functions.

## *Administrative Services*

The Division of Administrative Services which provides centralized office service facilities for the Department in the Washington metropolitan area as well as staff leadership in this function, recorded the following accomplishments during the year.

It established a permanent translation program in the Central Library so that all offices have access to foreign technical materials; installed new equipment in the Central Duplicating Section to provide a better quality of work at lower unit costs; adopted the "Postage and Fees Paid" system of paying official postal costs on a quarterly basis that provides faster service and eliminates the inventory and audit controls formerly required when postage stamps were used; disposed of 940 cubic feet of obsolete records; continued the renovation and modernization program in the Interior Museum.

## *Budget and Finance*

During the year the Division of Budget and Finance continued ts efforts at improving budget justifications and coordinating the ureaus' budget structures with their organizational pattern. The Division continued to cooperate in developing legislation to place he programs of the Bureau of Reclamation, the Bonneville Power Administration, and Southeastern and Southwestern Power Administrations on a revolving-fund basis.

Special analyses of employee health benefits costs were made for he Bureau of the Budget and the Congress. In the accounting field, he Division placed increased emphasis on systems improvements, and special effort was directed to installing systems in three bureaus of the Department. Also, modifications were made in approved systems to make them more useful to management. Plans were completed for accounting for and reporting on the financial results of the employee health benefits program which became effective in July of 1960. Action was taken during this period to define the scope and seek uniformity among the bureaus of the Department in internal auditing.

## *Inspection*

The primary purpose of the Department's Inspection Program is to insure high ethical standards in the management of the Department's affairs. The Division of Inspection provides policy guidance and coordination of this program. During the past year, the division stimulated initiation of inspections by bureaus and offices of the Department.

Inspection experience continued to be applied in the modernization of regulations dealing with employee behavior and in the shaping of administrative policy decisions. The investigative program embodies the use of investigative techniques in inquiries concerning alleged serious administrative irregularities in the discharge of official functions. During the past fiscal year, investigative work was maintained on a current basis.

The Division of Inspection also has responsibilities in departmental handling of matters under the Government Employment Policy enunciated in Executive Order 10590 and related Department regulations. Related Department regulations were revised as advocated by the President's Committee. By directive and otherwise, management appreciation of the nondiscriminatory policy has been extended through supervisory training, reporting systems and recircularization of basic data. Policy administration and enforcement were success-

*The Secretariat presented 19 Distinguished Service Awards and two Valor Awar at a departmental convocation held on April 11, 1960. The Distinguished Servic Award is the Department's highest honor bestowed on employees.*

fully continued, as evidenced by the fact that not one complaint o discrimination in the Department originated this year.

## *Management Research*

During the year, management analysis studies or major organization adjustments were made in the Office of Minerals Exploration, th technical and research organization of the Bureau of Mines, the Geologic Division of the Geological Survey, the construction activitie of the Bureau of Indian Affairs, and the organizational location o the Alaska Railroad by the Division of Management Research. Th management improvement program was given continued emphasi during the year with more than 150 projects included in the burea and office reports.

A new publication, A Supervisor's Guide for Work Improvement was prepared by the staff for use in connection with a department-wide program of training of firstline supervision to be carried out through the bureaus. The bimonthly Division pamphlet, Management Highlights, which is distributed to over 5,000 supervisors, gave particular emphasis to articles on management improvement and incentive awards. In carrying out its directives management responsibilities, approximately 275 documents were processed by the Division for secretarial action.

A series of Federal Register Document Improvement Workshops was conducted by the Division in cooperation with the Office of the Soicitor and the Division of Federal Register, National Archives, with over 100 employees partcipating. These workshops were based on the new department handbook on How To Prepare Federal Register Documents. The major steps in the development of the Departmental Manual were the initial issuance of the Delegation Series codifying secretarial delegations of authority and a restatement of policies on the Organization Series of the Manual.

The Incentive Awards Program continued at a high level of activity as indicated by the following comparative statistics with substantial gains in all phases of the program over the past 5-year period:

| | 1956 | 1957 | 1958 | 1959 | 1960 [1] | Percent increase 1956–60 |
|---|---|---|---|---|---|---|
| Suggestions submitted | 2,897 | 4,524 | 4,589 | 5,226 | 4,888 | +69 |
| Suggestions approved | 969 | 1,422 | 1,499 | 2,301 | 1,508 | +56 |
| Superior performance awards and special acts | 581 | 845 | 1,183 | 1,213 | 1,501 | +158 |
| Distinguished service awards | 43 | 37 | 26 | 64 | 40 | −7 |
| Valor awards | ........ | 8 | 6 | 7 | 4 | ........ |
| Meritorious service awards | 111 | 129 | 139 | 120 | 135 | +21 |
| Commendable service awards | 263 | 329 | 375 | 368 | 446 | +69 |

[1] Over 60 training sessions were held with supervisors and employees in Washington, D.C., and the field covering all phases of the incentive awards program.

## *Personnel Management*

During the past year the Division of Personnel Management placed emphasis on improving the overall quality of personnel management at all levels of operation. To this end, studies of staffing standards have been initiated, improvements have been made in methods of appraising the effectiveness of the personnel function in the Department, and cooperation and assistance have been given to efforts of the Civil Service Commission to improve classification and qualification standards and procedures, training, and executive development. Specifically, 17 new or revised policy directives, 3 new guides to better personnel management, and 2 training guides in safety have been issued.

More than 200 top- and middle-management executives have received specialized training in administrative and personnel management courses, and 40 management trainees have completed 5 or 7 months management training courses in the departmental programs. Continued progress was made in reducing the frequency rate and the cost of disabling work injuries. A group award was made to the Examining and Qualifications Standards Section of the Division for sustained outstanding performance in preparing policy statements and guidelines in the fields of examining, testing, placement, qualification standards and employment regulations.

## *Property Management*

Continuous effort was applied to programs of procurement from small business concerns and from manufacturers or suppliers located in areas of persistent unemployment by the Division of Property Management. All operating bureaus of the Department were encouraged to participate fully in the program of utilization of Government supplies and equipment excess to the needs of the Department of Defense. Conferences were conducted at selected field locations to inform all purchasing officers of new developments and improvements in procurement methods.

During the year personal property acquired at a cost of over $750,000, but no longer needed in Department programs, was donated to public schools and hospitals to meet urgent local needs. Eleven Records Disposition Workshops were conducted in Washington, D.C., with 162 participants. An estimated 60,000 square feet of filing floor space was freed through disposing of records no longer needed for current business. Technical and administrative liaison between the bureaus and offices and other Government agencies was provided for coordination and assignment of radio frequencies. Departmental instructions and information on radio communication were consolidated and issued as a new part of the Departmental Manual. A program for conversion of the Department's several thousand very-high-frequency land mobile radio stations to narrow-band frequency modulation was begun to conserve essential frequency spectrum space.

## *Security*

Physical security at critical facilities of the Department has been increased by the addition of safeguards under the direction of the Division of Security. A continuing review is being made of such facilities to insure that adequate security measures will continue to be placed in effect as warranted.

The personnel security program is under continuing review to assure that all clearances are kept up-to-date and that only necessary files are retained in the Department. During the current year over 700 files have been returned to the Civil Service Commission. The issuance and recording of all clearances is maintained on a current basis.

The bureaus and offices of the Department have assisted in several emergencies pursuant to a national declaration of a disaster by the President. This includes the floods of Nebraska and South Dakota in April 1960, and the Montana earthquake of 1959.

The radiological defense capability of the Department continues to improve. At the end of the fiscal year, well over 1,000 employees of the Department were trained in radiological monitoring and capability has been established in 42 States. The Federal Fixed Station Monitoring Network, which includes a large number of stations manned by Department personnel, has progressed to the point where in case of an emergency nationwide patterns of radioactivity can be reported to the benefit of the entire populace.

# *Office of the Solicitor*

**George W. Abbott, *Solicitor***

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OVER 140,000 MATTERS were considered in the Office of the Solicitor during the fiscal year and the number of matters pending at the close of the year was reduced to 7,648, as compared with 8,026 at the close of the previous fiscal year. More than 55,000 hours were spent in giving oral advice and the attendance at conferences and meetings. Major accomplishments during the fiscal year included the closing of:

- ▲ 58 Contract appeals
- ▲ 389 Indian affairs appeals
- ▲ 669 Tort and irrigation claims, including appeals
- ▲ 384 Land appeals

Requests from the Congress for the views of the Department on legislative proposals continue to grow, as does the number of reports submitted. A total of 1,612 requests were received and 1,178 reports were written. This is a larger number than in any previous session of the Congress.

In connection with the Davis and Featherstone contests to effect the administrative cancellation of oil and gas leases obtained from the Government through alleged violation of acreage limitations, numerous studies were made.

## *Legal Assistance*

Comments were submitted to the Department of Justice concerning the ability of the United States to carry out its functions of regulating the Colorado River, servicing water delivery contracts, and the performance of other Federal functions on the basis of the Special Master's Draft Report of Proposed Findings of Fact, Conclusions of Law and Recommended Decree in the case of *State of Arizona* v. *State of*

*California, et al.*, No. 9 Original, Supreme Court of the United States.

Assistance was given to the United States attorneys at Los Angeles, Calif., and Phoenix, Ariz., in connection with the institution of complaints filed against squatters along the Colorado River. The Secretary at the close of the fiscal year 1959 had recommended to the Attorney General that such action be initiated.

The attorney general of the State of Washington was given assistance in the preparation of briefs and oral arguments before the supreme court of that State relative to the question of State jurisdiction over matters involving minor Indian children. Two lower courts of the State had rendered conflicting opinions and the Supreme Court granted a writ of certiorari. It is expected that the decision of the court will serve as a landmark in regard to the matter of jurisdiction of State tribunals in certain Indian affairs.

## *Board of Contract Appeals*

In the appeal of the *Caribbean Construction Corporation* (66 id. 34), the Board of Contract Appeals adopted the so-called "jury verdict" approach which had theretofore been espoused by the Court of Claims. The Board held that a full adjustment, on account of changes ordered by the Government in the contract work or on account of changed conditions encountered in its performance, could be made on the basis of a fair and reasonable approximation of the costs incurred, arrived at through a studied consideration of the whole record.

In the case of the *Ocean Tow Inc.* (66 i.d. 409), the Board decided an important issue concerning the scope of its jurisdiction by holding ts jurisdiction in appeals was confined to appeals arising under contracts that contain a clause which, irrespective of its form, provides for the determination of disputes by the contracting officer and gives the contractor a right to appeal such determination to the head of the Department or his delegate.

## *Major Legal Decisions*

Two issues, long a subject of controversy, were decided by the United States Court of Appeals for the District of Columbia in *Foster et al.* v. *Seaton*, 271 F. 2d 836. The court ruled that the Administrative Procedure Act does not place the ultimate burden of proof on the Government to establish the invalidity of a mining claim in a contest brought by the Government and that in order to have a valid discovery in the case of nonmetallic deposits of widespread occurrence there must be a demonstration of present marketability, not merely prospective value. This decision has helped the Department to dispose of many troublesome cases involving nonmetallic deposit

Other litigation of particular interest to the Department include the decision of the United States Supreme Court in the case *Unite States* v. *States of Louisiana, Texas, Mississippi, Alabama, and Florida*, No. 10 Original. The Court held that the Submerged Lands Ac does not grant to the States of Louisiana, Mississippi or Alabama an rights in submerged lands beyond three geographic miles from thei coasts; and, that the act does grant to the States of Texas and Florid rights in such submerged lands for a distance of three marine-league from their coastlines.

# *Technical Review Staff*

## John B. Bennett, *Director*

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THE CONTINUING FUNCTIONS performed by the Technical Review Staff of the Department were redefined as of January 1, 1960, to emphasize its departmentwide responsibilities, and functions which were more readily identifiable as belonging to the fields of certain of the Assistant Secretaries were transferred to their offices.

In its capacity as liaison with the Senate Select Committee on National Water Resources, the Technical Review Staff coordinated 14 major reports, dealing with various aspects of water resource problems, which the committee had requested. The major categories with which these reports dealt were reclamation needs, uses in the minerals industries, fish and wildlife and recreation uses, and surface water.

The work of the Outdoor Recreation Resources Review Commission cuts across the activities of most bureaus of the Department. The Technical Review Staff has served in the past year to coordinate these interests in presentations made to the Commission.

In the coordination of the interests and responsibilities of the Department of the Interior in the minerals, fuels and fisheries fields, as affected by and as they might affect the work of United States participation in the General Agreement on Tariffs and Trade (GATT), the Technical Review Staff supplied a departmental representative to meetings of the contracting parties and several of its committees and working parties in Geneva, Switzerland, and Tokyo, Japan, and also to the Law of the Sea Conference, Geneva, Switzerland.

The Technical Review Staff arranged for official visits to the Department of foreign dignitaries and officials, scientists, and students interested in exchanging information.

The chairmen of the six field committees of the Department were called to Washington for two week-long meetings during the fiscal year, one in November and one in May. The purpose of these meetings was to discuss coordination of the activities of the Department a the field level.

Considerable staff work was done by the Technical Review Staf on the proposed Northeastern Water and Related Land Resource Compact. On January 18, 1960, a bill was introduced in the Senate t give the consent and approval of Congress to this compact. The compact differs from previous interstate compacts with respect to Federa participation.

The Technical Review Staff, in conjunction with the Division o Management Research, coordinated the review of the "Mass Transportation Survey Report—National Capital Region," prepared by th National Capital Planning Commission and the National Capita Regional Planning Council.

The Technical Review Staff maintained liaison with the Inter-Agency Committee on Water Resources; the Atomic Energy Commission on its "Plowshare" program; the National Science Foundation the Office of Statistical Standards, Bureau of the Budget; the Department of State and International Cooperation Administration; and with other Federal agencies on program matters of mutual concern

# *Oil Import Administration*

**Lawrence J. O'Connor, Jr.,** ***Administrator***

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THE SECRETARY OF THE INTERIOR, pursuant to Presidential Proclamation 3279, dated March 10, 1959, established the Oil Import Administration within the Department, issued regulations for the operation of an oil import program, and delegated the authority conferred upon him by the President to the Administrator.

The objective of the oil import program is to insure a stable, healthy petroleum industry within the United States capable of exploring for and developing new domestic petroleum reserves.

In administering the program, the Oil Import Administration:

1. Analyzes data prepared by the Department's Bureau of Mines relating to petroleum demand in the United States, by commodity type and petroleum districts, in order to set the overall amounts of crude and unfinished oil, and finished petroleum products to be allowed into the United States and Puerto Rico.

2. Establishes equitable semiannual oil import allocations for individual eligible oil importers by product type and district, other than residual fuel oil (which is on a quarterly basis), and issues import licenses.

3. Analyzes monthly reports from each importer showing the amount and disposition of petroleum imports entering the Nation under license and issues public reports concerning the oil import situation and the administration of the program.

4. Responds to an increasing volume of requests for information concerning the administration of the program from Congress, the press, foreign governments, other governmental agencies, and the public.

## *Summary of Activities*

During Fiscal Year 1960, the Oil Import Administration issue 1,852 licenses for importation of crude petroleum and its derivative to eligible importers according to commodity type.

Prior to the close of the fiscal year, the Administrator announce overall oil import levels for the allocation period July 1, 1960, throug December 31, 1960, and issued individual oil import allocations t 179 eligible importers.

In order to administer the oil import program more effectively the allocation period for residual fuel oil was changed from a semiannual to a quarterly basis effective July 1, 1960.

# *Oil Import Appeals Board*

## Royce A. Hardy, *Chairman*

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THE OIL IMPORT APPEALS BOARD was established on March 13, 1959, to consider petitions by persons affected by the Mandatory Oil Import Program proclaimed by the President on March 10, 1959.

The Board is authorized, within specified limits, to modify any oil import allocations granted by the Oil Import Administration, on the grounds of exceptional hardship or error; to grant allocations of crude oil in special circumstances to persons with importing histories who are ineligible for allocations; to grant allocations of finished products on the ground of exceptional hardship to persons who are ineligible for allocations; and to review the revocation or suspension of any allocation or license.

### *Board Activity*

During fiscal 1960 the Board reviewed 79 petitions. 64 petitions were considered on their merits, 10 petitions were dismissed because the Board lacked authority to consider them, and 5 others were withdrawn.

Of the 64 petitions considered by the Board on their merits, 35 followed public hearings before the Board, requested by the petitioners. Public hearings were not requested by the petitioners in the remaining 29 petitions and they were disposed of on their records. The Board granted relief in several instances based upon grounds of special circumstances and importing history.

In denying relief, the Board for the most part found that the petitioners had not established exceptional hardship directly attributable to the Mandatory Oil Import Program.

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OR THE FISCAL YEAR ENDED JUNE 30

# Resources for Tomorrow

# 1961 annual report

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DIVISION

THE SECRETARY OF THE

# INTERIOR

STEWART L. UDALL

# 1961 *Annual Report*

# THE SECRETARY OF THE INTERIOR

Stewart L. Udall

March 3, 1849

*For the Fiscal Year Ended*
*June 30, 1961*

March 3, 1849

THE SECRETARY OF THE INTERIOR
WASHINGTON

Dear Mr. President: Transmitted herewith is the annual report of the Department of the Interior for the fiscal year 1961.

In preparing this summary of departmental activities we have been mindful of the statement in your special message to the Congress on natural resources that wise investment in a resource program today will return vast dividends tomorrow.

As you have said, our country has been generous to us in this regard—and we cannot now ignore her needs for future development.

In the year just past we have made great strides toward the sound conservation and development of our water, our land, our forest, and our mineral resources.

But perhaps more importantly we have laid the groundwork for programs just getting under way which in the years ahead will assure America of adequate resources to meet its growing needs.

Sincerely,

Stewart L Udall

*Secretary of the Interior.*

The President,
*The White House.*

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# *Part* I

# RESOURCES FOR TOMORROW

# Resources for Tomorrow

The Department of the Interior has the prime function of planning for the future of America and working to conserve the natural resources which sustain its life.

But because so much of what is happening inside America today is drowned out by the clamor of an embattled world, it is only recently that we have become aware of a growing internal crisis which deeply affects the lives of all Americans.

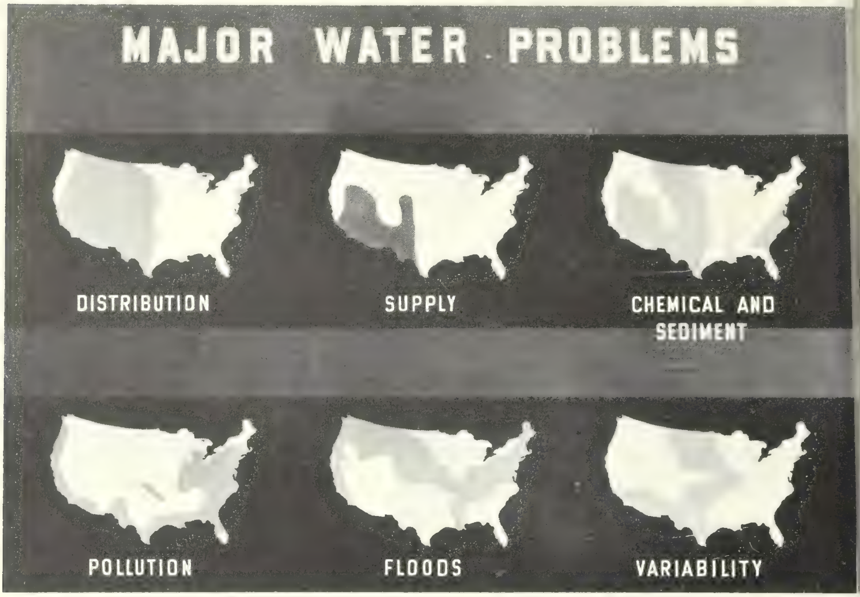
This "Quiet Crisis" concerns a battle being waged against us from within by the forces of natural progress and explosive growth. In its wake across America this battle has left polluted rivers and lakes, disappearing open space, overcrowded parks, declining resources, the threatened extinction of certain species of our wildlife, and dwindling opportunties for the outdoor experiences which through the years have had such a profound influence in shaping the national character of America.

## *At Odds With Our Environment*

Never before has man been so at odds with his environment as we are in America today. In the short span of a hundred years—the century that bridges our great westward expansion and the present day—we have created forces hostile to nature that, given full sway, could in time make us strangers in our own land.

A great poet has written of our continent: "The land was ours before we were the land's."

As we survey the developments of the past two decades, we are driven to the inescapable conviction that the land which we and our forebears knew will not be "ours" for long unless we arrest the forces that would alter and blight it and despoil its fruits.



We are seeing the face of America change. This has been going forward rapidly, as we all know, since the end of World War II. For example, today more than a million acres of land each year is being converted from open space into industrial and commercial developments of various kinds.

Let us look at another of the changes. Forty years from now it is predicted that 85 percent of the people of this country will be living in urban centers. Consider how this movement will affect, among other things, the great problem of our water needs. We can anticipate these needs will double with our population growth in the next 20 years; they will quadruple in the next 40 years. Already there are areas where growth has been checked because of water shortages. Only in recent years have we realized that water is a resource with limitations.

There is the question, too, in this movement to urban centers, of how the enormously increased requirements for electric power will be met. Here the projected growth in demand even far outstrips our future water needs.

This again indicates the crises that we face in terms of conservation. Indeed, how our cities grow and how we use our resources will determine in the long run what kind of lives our people lead and what kind of people we are.

If we are to maintain man's proper relationship with nature, it is plain that we must broaden the role of resource planning in the management of our national affairs.

*One of the greatest natural resource challenges of the 1960's is to insure that the urban population of America has open spaces near their teeming metropolises where a few quiet hours can be spent.*

The American continent has, from the beginning, been hospitable to mankind. Its glories and its gifts have made possible the kind of life we know in America today. But the good earth will remain good only so long as we make it so.

## *A Forecast of Things to Come*

Many years ago, Theodore Roosevelt summed up the challenge which we face today when he said: "To skin and exhaust the land instead of using it so as to increase its usefulness will result in undermining in the days of our children the very prosperity which we ought by right to hand down to them."

Each element of the "Quiet Crisis" in which we are now involved represents, at this stage, no more than a serious inconvenience, together with an uneasy prospect of the future. But—taken together—they add up to a circumstance that threatens the wellsprings of our national existence.

The history of man's progress is, in large measure, the chronicle of his emotional and physical relationship with the land—and, through the land, with himself and his fellow man. In America, we found a virgin continent with magnificent landscapes and a seemingly inexhaustible supply of natural resources. A good many of the qualities which we ascribe to our national character—humility, the sense of fair purpose and fair play, generosity, to name a few—are based to large degree upon our finding of the bounties of this land.

But what of America in the 20th century? How can we measure ourselves against traffic jams, blight, smog, polluted streams?

If a measurement is made, can we find ourselves otherwise than wanting in our environment of today?

At no time has a society achieved so much in the way of material progress—but at the same time allowed so many of its basic values to fall by the wayside.

And—in the strict accounting—one of the most vital of the values we have allowed to slip away is our oneness with the land—the utilization of the land's resources to give the American people the maximum of enjoyment, understanding, and inspiration from the sites and objects inherited from our past.

## *Time To Call a Halt*

Admittedly, we must move ahead with the development of our land resources. Likewise, our technology must be refined and stimulated. But in the long run life will succeed only in a life-giving environment.

*The beauty of nature and nature's works has always been an inspiration in American life. The park resources of America and the responsibility for their protection and enhancement rests with the Department of the Interior as one of its greatest resource challenges of the future.*

We can no longer afford unnecessary sacrifices of living space and natural landscapes.

The sad truth is that development tends to outrun planning in our society. More often than not the wrecker's work is done before the conservationist and the planner arrive on the scene.

If we are to maintain man's proper relationship to the land, it is plain that we must insist that our developers be more conservation-minded, and we must broaden the role of resource planning in the management of our national estate.

In our haste to build new factories and roads and suburbs we must take care that man's need to refresh himself in his natural environment is not foreclosed, and that our basic resources—water, timber, fuels—are not unnecessarily diminished.

President Kennedy has called for one last great effort in the 1960's to finish the conservation work begun by Theodore Roosevelt who long ago counseled Americans to "set apart forever for the use and benefit of our people as a whole rich forested lands and . . . the flower-clad meadows of our mountains."

"This nation," the President said, "cannot lose sight of its natural resources—its land, wood, and water—while building its military might. We hold the sword, and we are determined to maintain our strength and our commitments. But we also hold in our hands the trowel."

This spirit motivated the first major conservation accomplishment of President Kennedy's administration—the creation of a magnificent National Seashore Park on the ocean sands of Cape Cod, in an area close to major population centers of the East.

Through this action, one of the most beautiful of America's remaining unspoiled open spaces will be preserved for all time for the use and enjoyment of this and the generations to come.

But at every hand near our growing centers of population similar opportunities are slipping through our fingers. Once land development has begun it is invariably "too late," for land prices quickly soar beyond the public purse.

## *Cooperative Effort Is Needed*

What strategy, what plan of action, will save enough space for all of our people? Leadership from our public men is, of course, indispensable. Federal action is needed to round out our national park and wildlife refuge systems and to develop fully the recreation and timber potential of our forestlands.

We must also have aggressive State park expansion programs to reserve new parklands before they are pre-empted. Municipal leadership, too, is essential if we are to provide adequate city park systems and enough fringe open space to permit our cities to expand gracefully.

We also need—and here the burden falls heaviest on local leadership—creative and farsighted use of zoning regulations and land use plans to compel the speculator and developer to put people first and ensure that adequate space is allotted to playgrounds and parks.

Government can provide the main thrust, but individuals must play a creative role if we are to ensure an adequate heritage for all Americans.

If our growth in the years ahead is to leave America a better, rather than a poorer, place in which to live, we must give far more attention to our uses of land and water, forests, fish and wildlife, parks and wilderness, minerals and fuels, and we must embark, while time allows, on an active preservation of the remaining open spaces which surround our populated areas.

In the future we can live in a land which is still worthy of being called "America the Beautiful" . . . or our cities can be hemmed in by a billboard-studded wasteland running monotonously from one super-city to another. The choice is ours—and the time to make the choice is now.

## *New Horizons*

Under the vigorous leadership of the Kennedy Administration, this Department, in close collaboration with other Federal, State, and local agencies, is moving rapidly toward new horizons of resource conservation and development concerned not only with wildlife and natural resources, but with man himself.

The significance of our concern with the human resource has been well expressed by Wallace Stegner, the distinguished novelist, when he wrote:

"Something will have gone out of us as a people if we ever let the last remaining wilderness be destroyed, if we permit the last of our forests to be turned into comic books and plastic cigarette cases, if we drive the few remaining members of the wild species into zoos or extinction, if we pollute the last clean air or dirty the last clean streams or push our paved roads through the last of the silence.

"Not many people are likely any more to look upon what we call progress as an unmixed blessing. Just as surely as it has brought us increased comfort and more material goods, it has brought us spiritual losses and it threatens to become the Frankenstein that will destroy us."

## *Land and Recreation*

One of the most important segments of this vigorous new program is concerned with our relationship to, and our use of land.

In his special message to the Congress on natural resources in February 1961, President Kennedy pointed out that he had instructed the Secretary of the Interior, in cooperation with the Secretary of Agriculture and other appropriate Federal, State and local officials and private leaders to:

- formulate a comprehensive Federal recreational lands program;
- conduct a survey to determine where additional national parks, forests, and seashore areas should be proposed;
- take steps to insure that land acquired for the construction of Federally-financed reservoirs is sufficient to permit future development for recreational purposes; and,
- establish a long-range program for planning and providing adequate open spaces for recreational facilities in urban areas.

Action to bring about these long-needed improvements in our recreational land planning and management is well under way.

At the same time, programs are being accelerated which will result in the more productive use of our public land. The Federal Government has responsibility for nearly 770 million acres of such land, much of it devoted to a variety of essential uses. But, for a number of reasons, some 477 million acres of public domain lands remain vacant, unappropriated and unreserved. Obviously, this represents a vital national reserve that should be devoted to productive use now and maintained for future generations.

To bring about this end, the Department of the Interior has taken steps in this Administration to:

—accelerate an inventory and evaluation of the nation's public domain holdings to serve as a foundation for improved resource management;

—develop a program of balanced usage designed to reconcile the conflicting uses—grazing, forestry, recreation, wildlife, urban development and minerals, and,

—accelerate the installation of soil conserving and water saving works and practices to reduce erosion and improve forage capacity; and to proceed with the revegetation of range lands on which the forage capacity has been badly depleted or destroyed.

## *Meeting Our Water Problems*

Today in the United States we are using more than 300 billion gallons of water a day. By 1980, we will need 600 billion gallons a day.

This is going to be one of our most critical problems in the years ahead.

Water problems in one form or another touch all 50 States of the Union. In some areas it is a problem of availability, in others of salinity or quality; it may be a problem of maldistribution or in some cases a problem of excess. Regardless of the cause, as a Nation, we can no longer regard with parochial indifference the increasing imbalance between the supply and the demand for water in the United States.

At the same time, our available water supply must be used to give maximum benefits for all purposes—hydroelectric power, irrigation and reclamation, navigation, recreation, health, home and industry. If all areas of the country are to enjoy a balanced growth, our Federal Reclamation and other water resource programs will have to give increased attention to municipal and industrial water and power supplies as well as irrigation and land redemption. This Department, with the full cooperation and support of President Kennedy, is taking steps to speed the development of a balanced program to meet our water needs.

Already, as another major conservation achievement of this Administration, approval of the Congress has been won for pollution control legislation. This comes at a time when pollution of our country's rivers and streams has—as a result of our rapid population and industrial growth and change—reached alarming proportions. To meet all needs—domestic, agricultural, industrial, recreational—we shall have to use and re-use the same water, maintaining quality as well as quantity. In many areas of the country we need new sources of supply—but in all areas we must protect the supplies we have. The newly enacted pollution control legislation will, in the years to come, help make this possible.

At the same time, in an equally important action, the Congress authorized a $75 million program which enables the Department to greatly accelerate its work toward development of the best and most economical processes and methods for converting saline and brackish water into water suitable for beneficial consumptive purposes.

The Act instructed the Secretary of the Interior to place emphasis on the conduct, encouragement, and promotion of fundamental scientific research and basic studies looking toward solutions of saline water conversion problems. To this end, at President Kennedy's request, a panel of his Science Advisory Committee has been working with the Department to assure the most vigorous and effective research and development program possible in this field.

*Seated at his desk in the White House, President Kennedy presses a special button, made of magnesium extracted from sea water, to start fresh water flowing from the water conversion demonstration plant at Freeport, Tex., on June 21, 1961. With the President are Dr. Leland Doan, president, and (r) Dr. A. P. Beutel, vice president of Dow Chemical Company.*

An example of the progress now being made in this vital area may be seen in the fact that in June 1961 President Kennedy pressed a button at his desk in the White House which set the machinery in motion—across the nation at Freeport, Texas—of the first saline water demonstration plant constructed by the Federal Government in cooperation with private industry—a million-gallon-a-day plant that is already in the Freeport municipal water system.

Within months, dedication ceremonies were held marking completion of construction of a 250,000-gallon-a-day plant to demineralize the brackish well water at Webster, S. Dak., and construction was nearing completion on a second million-gallon-a-day sea water conversion plant at San Diego, Calif. Building of two additional plants in New Mexico and North Carolina is scheduled to begin in the coming fiscal year.

### *Science Advisor Appointed*

Strengthening of still another vital water resource program—that dealing with oceanography—was assured during the year with the appointment of the noted scientist, Dr. Roger Revelle, as Science Advisory to the Secretary of the Interior.

Serving as the first science advisor in the history of the Department, Dr. Revelle is on leave of absence from his post as director of the University of California's Scripps Institution of Oceanography.

For the past several years, he has also been dean of the University's School of Science and Engineering at La Jolla, and, in addition to his contribution to the Department's work in oceanography, he will advise on and coordinate the numerous programs in other scientific fields.

### *Electric Power*

In his 1961 message to the Congress on natural resources, President Kennedy had this to say in regard to electric power:

"To keep pace with the growth of our economy and national defense requirements, expansion of this nation's power facilities will require intensive effort by all segments of our power industry. Through 1980, according to present estimates of the Federal Power Commission, total installed capacity should triple if we are to meet our nation's need for essential economic growth. Sustained heavy expansion by all power suppliers—public, cooperative, and private—is clearly needed.

"The role of the Federal Government is supplying an important segment of this power is now long established and must continue . . .

"Hydroelectric sites remaining in this country will be utilized and hydroelectric power will be incorporated in all multiple-purpose river projects where optimum economic use of the water justifies such action."

*A night scene at Grand Coulee Dam symbolizes the hydroelectric challenges faced by the Nation today. With three times as much power considered necessary in 20 years, the full hydroelectric potential of the Nation will play an important part in meeting these needs.*

At the same time, the President directed the Secretary of the Interior to develop plans for the early interconnection of areas served by the Department's marketing agencies with adequate common carrier transmission lines; to plan for further national cooperative pooling of electric power, both public and private; and to enlarge such pooling as now exists.

In an initial move to comply with this directive, the Department established a special task force to study the feasibility of interconnecting the lines of the Bonneville Power Administration in the Pacific Northwest and those of the Central Valley Project in California.

Realizing the need to improve the existing transmission system, both public and private, the Department appointed a committee to begin studying possibilities of standardizing equipment in operations of an extra high voltage system. It invited private power interests to name a comparable committee to cooperate in an initial effort to standardize voltages looking toward eventual construction of a common carrier power grid.

An encouraging development resulting from this action came in September when the Edison Electric Institute outlined plans for a 10-

year program of transmission line construction which could well open the way for a major cooperative planning effort of inter-connecting and pooling facilities of public systems with those of private industry.

In a statement issued following the Institute's announcement, the Secretary of the Interior declared:

> I am encouraged to learn of these new plans for pooling and interconnection of the Nation's power company systems. Since President Kennedy issued his message on natural resources in February of this year, there has been an increasing awareness on the part of the entire utility industry of the need to make optimum use of the Nation's electric power facilities.
>
> It is timely that both public and private sectors of the power field are looking beyond mere interconnection of lines and are considering the mutual advantages of extra-high voltage transmission. Many countries in western Europe have already proved the mutual benefits attainable by such cooperation.
>
> The logical next step is a cooperative industry-governmental effort to plan for the full utilization of the present and future facilities of private industry, consumer-owned utilities, and the Federal Government. These public agencies represent nearly 25 percent of the Nation's electric power industry. Such a move would be in the interest of sound, complete, overall planning. Wherever practicable, these major lines should be operated on a common carrier basis.

Meanwhile, the Congress approved construction on an all-Federal basis of the backbone transmission lines required to market the power generated by the giant five-State Colorado River Storage Project, and steps were immediately taken to expedite planning and progress toward completion of the undertaking. Simultaneously, the Department urged public agencies and private power companies to cooperate with it in working out a transmission system beyond the basic backbone system that will ensure the economic growth of the Colorado Basin, and promote the stability of the entire power industry.

A first step was taken toward the development of a striking new conservation tool for our electric power resources with the undertaking of studies looking toward so-called "pump-back" storage systems which permit the use of generation capacity during slack demand periods to build power reservoirs which can be pumped back into use at peak periods of power use.

## *The Challenge of the Future*

These, then, are a few examples of how the Department of the Interior is moving as speedily as possible to develop our national resources for tomorrow. There are many others. For instance, new trails are being blazed for the American Indian through implementation of a Kennedy Administration task force report calling for greater emphasis on Indian education and the wider use and development of natural resources on the reservations.

In Reclamation, work is under way to schedule a progressive, orderly program of starting new projects to meet accumulated demands.

Similar actions are under way in regard to the conservation and development of our minerals, our fuels, our helium resources, our forests, and our wildlife. In the following pages, all of these vital programs will be discussed in detail, and the progress shown.

From its earliest days as the "housekeeping" agency of the Federal Government and through the period when it played an important role in the winning of the West, this Department has, in effect, become the "Department of the Future."

Its responsibilities in regard to natural resources have become not only national but international in scope.

The Department—at this challenging period in its existence—recognizes that the demands of a growing industrial society at home, as well as the nation's commitments to defend freedom abroad, presents it with the most serious resource demands.

Whether our physical and spiritual resources prove adequate to meet our needs tomorrow will be determined by the decisions we make—or fail to make—today.

This is the moment of decision in resource conservation.

Our actions toward this goal during the challenging 1960's will determine the character—and the achievements—of this nation for many years to come.

## *Our Outdoor Recreation Needs—Planning for Tomorrow*

Under Theodore Roosevelt, a million and a half acres of outdoor wilderness was added to our national park system. Woodrow Wilson's administration provided a record 5.3 million acres of this precious resource, and under Franklin D. Roosevelt, the nation was enriched by an addition of another 3.5 million acres in our national parks.

But from the end of World War II until the start of President Kennedy's administration, America has added but 93,000 acres to its system of national parks.

During this period we as a people have failed to keep our trust for the future—failed to act with the traditional conviction and knowledge that America's strength flows from its streams, its mountains, its forests—from the land itself.

*The majesty and wilderness of Cape Cod has successfully been preserved for public use by present and future generations through dynamic action to create a series of new National Seashores.*

The cumulative effect of this neglect on the tomorrows to come may be seen in the fact that population projections indicate that in the next four decades the demand for municipal parks and playgrounds will increase 4 times, the demand for State and county recreation centers will increase 16 times, and the need for wilderness and seashore parks will be 40 times greater than it is today.

For nearly a score of years, the growing current needs for outdoor recreational space and facilities have, on a national basis, been largely neglected or ignored—to say nothing of the total inadequacy of planning for the far greater requirements of the future.

Today, we are losing a million acres of open space each year to various kinds of developments. Obviously, the trend from open space to "asphalt jungle" cannot be allowed to continue at this pace.

### *"One Last Great Effort"*

In 1961, the Department of the Interior acted with all possible speed and vigor to respond to President Kennedy's call for "one last great effort" to round out the conservation programs given their start under Theodore Roosevelt.

In less than a year, a new seashore area has been added to our national parks system; a wetlands acquisition act is offering new protection to our waterfowl; expanded programs are under way in soil conservation, resource management and land use; and, by administrative order, millions of acres of public lands have been made available at low cost for park and recreational—as well as educational—purposes.

The Department's National Park Service increased its efforts during the year to preserve, while there is yet time, such outstanding and spectacular areas as: Padre Island, Tex.; Point Reyes, Calif.; Oregon Dunes, Oreg.; and Pictured Rocks and Sleeping Bear Dunes in Michigan.

At the same time, the Department also was giving increased attention to the need for recreation areas readily accessible to centers of population in the East. Among such areas under consideration are the Allagash country in Maine; Tocks Island in Pennsylvania, New Jersey and New York; and Between-the-Rivers in Kentucky and Tennessee.

In the West and Midwest, efforts are going forward for new parks and recreation areas such as the Canyonlands of Utah; the Great Basin of Nevada; Rainbow Bridge of Arizona and Utah; Jemez-Bandelier in New Mexico; the Ozarks River in Missouri; and a Prairie National Park in Kansas.

### *Footing the Bill*

This generation in the coming decades has a "last-chance" opportunity to save perhaps 15 or 20 million acres for national parks, another 2.5 million acres for national recreational areas, more than a million acres for national parkways and scenic roads, and 4.5 million acres for wildlife refuge areas. The program even if spread out over the next few decades will be costly, but the costs will rise with each year of delay.

To help meet these costs—and to speed the program of land acquisition—the Department has proposed legislation to permit some Federal funding device specifically earmarked for this purpose; not for national park and recreation areas alone, but for State and local use as well. This would form the basis for a nationwide Federal grants-in-aid program that would be available to all levels of government on a matching basis for the acquisition of "open spaces."

*The wild lakes and mountains, too, represent an intrinsically valuable resource asset in America and our efforts to preserve a portion of this pristine grandeur must be increased.*

Quite recently, a number of our States have shown indications of their growing awareness of the "Quiet Crisis" in the field of outdoor recreation. Ten years ago, the States were spending only $10 million annually on parks and recreational areas. In 1960, the figure rose to $87 million, and in the calendar year 1961 it is expected to total an investment of some $110 million in the preservation and maintenance of mountain, seashore, lake, and river park areas.

In these programs, a variety of financing methods are being used. Minnesota is earmarking gasoline taxes for park land acquisition and development. Wisconsin is financing its future parks from a 1 cent tax on cigarettes. Missouri uses a portion of property taxes. A $75 million bond issue in New York provides $20 million for State parks and $40 million for grants to counties and municipalities on a 75 percent State and 25 percent local matching basis. Michigan's $10 million park acquisition and development bond issue will be retired by a $2 annual sticker fee and a single 50-cent admission charge.

Legislation providing multi-million dollar bond issues for park and conservation purposes has been passed from New Hampshire to California, including New Jersey's aptly-named $60 million "Green Acres Bond Act of 1961."

### *Combined Effort Required*

Actually, as President Kennedy has said, what is required is a pooling of funds and effort by local, State and Federal governments if present and future recreational needs are to be met.

In recognition of this fact, the National Conference on State Parks, the American Institute of Park Executives, and other groups and organizations are cooperating with the Department in the organization of a new program known as Parks for America.

Parks for America represents a concerted national effort to seek authority and money to bid successfully in the competitive land market while suitable parklands are still available, and to defend existing parks against the threatened encroachment of commercial development. At the close of the fiscal year, the new program was gaining considerable momentum across the country.

### *Nationwide Planning*

At the same time, as an integral part of Mission 66, the Department's National Park Service is preparing a nationwide plan for parks, parkways, and recreation areas to be published early in 1962, outlining a program that would provide all segments of our present and future population with adequate and readily available outdoor recreation areas. In the studies leading to the plan, the Service is working closely with the President's Outdoor Recreation Resources Review Commission.

The report will present a list of specific potential sites as well as recommended sites for consideration as parks, parkways and recreation areas of local, State and national significance in each of the 50 States. Following its publication, the National Park Service expects to cooperate with the States in the preparation of State recreational plans.

### *Creating a New "Shoreline"*

The Department of the Interior has long been concerned about our vanishing shoreline—the rapid movement of coastal lands into uses which deny public enjoyment and appreciation.

Water is one of the major recreation attractions in the United States—a lake for boating, fishing, swimming, or for a scenic setting for a family picnic or campsite—and today the man-made reservoir

lakes of the Department's Bureau of Reclamation are in a sense creating a new and growing inland shoreline, one which now totals more than 7,000 miles devoted to public use.

The scope of this development may be brought into clearer perspective when it is considered that in California three projects alone—Shasta, Trinity and Whiskeytown Lake—are creating some 520 miles of shoreline, more than the straightline distance between New York City and Detroit, Michigan, in the Middle West.

Some idea of America's appreciation of this major new recreational resource may be seen in the fact that, in 1960, nearly 25 million visits were recorded at 177 Bureau of Reclamation recreational areas, and this figure was considerably exceeded in calendar year 1961.

## *Recreation on Public Lands*

To provide still further recreational resources, the Department during the year inaugurated an intensive program for expanded recreational use of public lands.

In the past, a stumbling block in the progress of State and local programs was their inability to finance expensive land acquisition. To remedy this, the Department introduced a new pricing schedule for the sale to State and local governments of public lands expressly for outdoor recreation. Such tracts and areas can now be purchased from the Department's Bureau of Land Management for $2.50 an acre. Leases are 25 cents an acre per year. But the lands must be dedicated to outdoor recreation for the public use of all Americans as a condition to their acquisition from the Federal Government.

As an additional stimulus, Congress has raised the total acreage that a State can acquire annually from the Government for use as parks. The limit of 640 acres per year has been raised to 6,400 acres per year and temporarily lifted to 12,800, with a minimum of six sites, for 1961 and 1962.

A unique action affecting the use and management of public land was taken early in 1961 with the formal designation by the Secretary of the Interior of a 92-square-mile Federal-State cooperative land and wildlife management area in south-central California.

The area—lying about halfway between Los Angeles and San Francisco—has been designated the Caliente National Land and Wildlife Management Area. Representing the first formal Federal-State land and wildlife area in the United States, it will consist of nearly 60,000 acres of public lands administered by the Department's Bureau of Land Management in cooperation with the Fish and Wildlife Service and the State of California. Through a cooperative program, the Department and the State will develop the wildlife, recreational and other natural resources of the land.

Following this initial move in the inauguration of a new type of public land management program, the Department during the fiscal year had under consideration 25 similar proposals covering approximately 850,000 acres in California.

## *Recreation Potential on Indian Lands*

Many of the Indian reservations, because of their size and geographic location, offer outstanding possibilities for recreational developments. Major types of recreational potentialities include camping, boating, hunting, fishing, and all types of water and winter sports.

The geographic range includes the semitropical environment of the Seminole reservations in southern Florida, the desert landscape of the Papago Reservation in Arizona, and the alpine areas on the Wind River Reservation in Wyoming. It also encompasses the vast and colorful semidesert areas on the Navajo Reservation and numerous wilderness and scenic areas on reservations in Arizona, Oregon, Washington, Wyoming, and other States.

In the past, only limited progress has been made in developing these recreational resources. Outstanding examples are the tribally developed Monument Valley tourist enterprise on the Navajo Reservation in northern Arizona, and the fishing, hunting, and camping facilities that have been made available for public use on the Fort Apache Reservation in the east-central portion of the same State.

During 1961, however, there was evidence of rapidly growing tribal awareness of the benefits to be realized from such developments. At the close of the fiscal year, several additional tribes had plans in preparation, or under consideration by the Department, for the development of recreational facilities.

Unquestionably, in the years ahead, the Indian reservations will play a steadily widening and growingly fruitful role in meeting the nation's recreational needs.

### *Expanding Our Wildlife Resources*

Wildlife plays a unique role in America's outdoor recreational activities. For this, if for no other reason, it is a resource we have a responsibility to pass on to those who follow us.

But our wildlife, too, is facing its own "Quiet Crisis." Large numbers of species can be maintained only if there are large areas of the habitat they require. For example, wetlands are a vital requirement of many forms of wildlife. Great flights of waterfowl are just some of the creatures which need these areas. A wetland inventory published during the year by the Department's Fish and Wildlife Service listed 38 game and furbearing species reported by the various States as making use of one or more of the 20 types of wetlands.

Yet drainage and destruction over the years has taken a heavy and evergrowing toll.

The Department is moving ahead on a wetlands acquisition program to guarantee the existence of a network of key areas required to maintain a large population of waterfowl. At present, there are about 3.5 million acres of land in Federal refuges and about 2 million acres have been acquired by the States. It is estimated that at least another 7 million acres are required in public control.

*Pressures on the migratory bird resources of America are increasing annually Without adequate breeding grounds in the potholed prairies of North Americ and Canada, scenes of resting ducks in hunting grounds may disappear.*

## *Funds for Acquisition*

The Department's Bureau of Sport Fisheries and Wildlife has worked closely with the four Flyway Councils—which represent the States—on acquisition plans, setting up priorities and making decisions as to who will buy which areas with Federal and State funds. These plans will be reviewed annually to keep them up to date. Currently, it is planned that the Federal Government will acquire 4.5 million acres and the remaining 2.5 million will be purchased by the States.

Federal wetland acquisitions are financed from the revenues from annual sales of duck stamps. With receipts expected to average $5 million to $6 million a year and the cost of the 4.5 million acres for Federal acquisition estimated at $227 million, simple arithmetic clearly shows that acquisition under this arrangement would require from 38 to 45 years—provided the land were still available and there was no increase in land prices.

To meet this problem, the Congress—in one of its major conservation actions of 1961—approved a Departmental proposal that it be llowed to "borrow" funds against future duck stamp revenue to peed up wetlands purchase.

With a 7-year advance of $105,000,000 under this program, the Department of the Interior will be enabled to make a major contribution to the preservation of wildlife as a recreational resource for tomorrow.

## *The "Growing Giant"*

Marine sport fishing—the "Growing Giant"—is becoming "big" not only from the standpoint of the number of anglers it is attracting, but also because of the large number of industries—boats, motors, fuels, food, tackle, housing, charters, and numerous other services—it supports.

Today marine sport fishermen catch half a billion pounds of fish a year—and spend more than half a billion dollars doing it. Obviously, this is not only a form of outdoor recreation available for everyone—but also an economic resource of considerable importance to the national economy.

As our human population expands, future added needs in recreational angling will be largely met in two areas—from salt water species along our coasts and through improved management of the reservoirs now existing and to be created.

In the Department of the Interior, we have launched an expanding program of salt water sport fishery research, and we are developing plans for similar comprehensive research into reservoir fishery management.

Through these and other research and action programs, the Department is moving to assure "fish for the future" as a part of the general conservation and expansion of our recreational resources which President Kennedy has listed as among the vital needs of our national strength and vitality in the years to come.

## *The Growing Urgency of the Water Problem*

Unless ways are found to save more fresh water and to convert salt water cheaply into fresh, the United States only 20 years from now will lack enough water to meet its needs.

In 1961, the need was emphasized when drought laid a searing hand across the upper plains area from nothern Wyoming to Canada, while maintaining a 3-year reign over the thirsty lands of the Southwest.

*Pressures on the sports fishery resources of America by its ever-growing population makes it imperative that programs of the Department to meet these needs are pressed forward.*

It was further underscored when, early in the year, the Senate Select Committee on National Water Resources published its report on an intensive 2-year water study in which the Department of the Interior and other agencies participated.

The committee found evidences of already substantial areas of water shortage in many of the river basins in the western half of the United States. Its water supply-demand studies showed that full development of all available water resources in five regions of the West will be required by 1980 or earlier if the needs of the growing population are to be met and the projected expansion of economic activity achieved.

The report also estimated that by the year 2000, three other regions—including one area east of the Mississippi—will be added to the list of those in which full development of available water resources will be required if the projected demands are to be met.

### *Advance Warning by the President*

In his precedent-setting special message on natural resources early in his new Administration, delivered in February long before the 1961 drought impact was fully apparent, President Kennedy expressed concern lest more immediately recognized problems compete adversely with the long-range challenge of water resource development. "The problems of immediacy," he said, "always have the advantage of attracting notice—those that lie in the future fare poorly in the competition for attention and money." Under the circumstances, he called for the fullest participation and cooperation of Federal, State, and local governments and private interests in wisely and effectively facing up to our natural resource problems—and in particular, those concerning our water supplies.

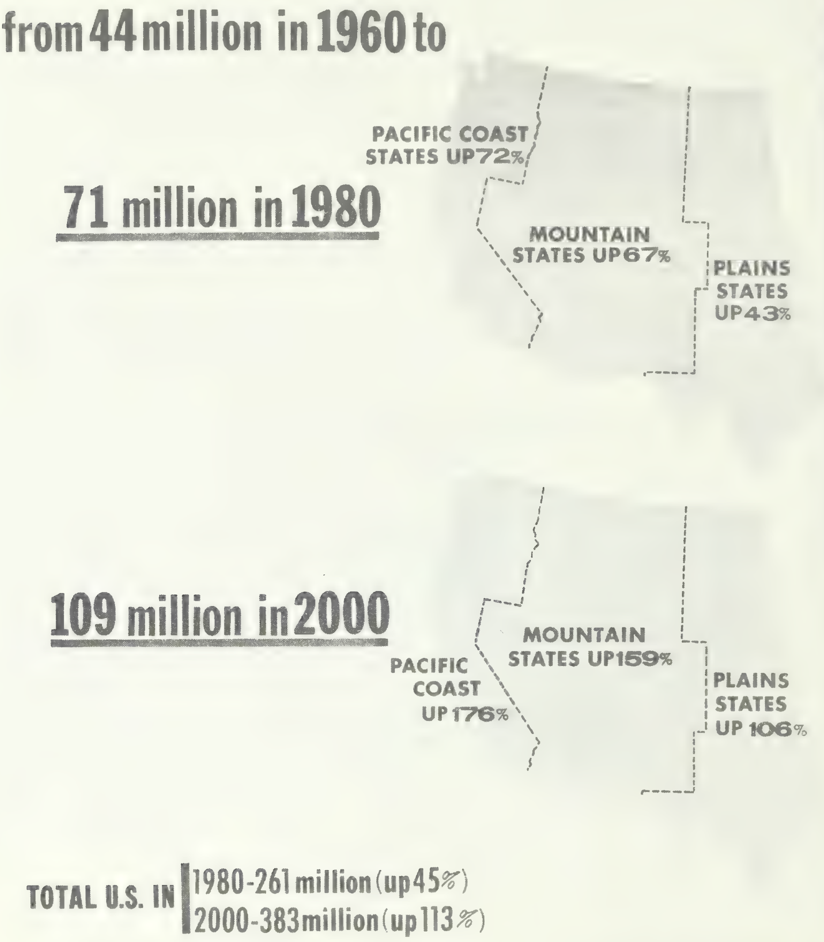
"The task is large," President Kennedy declared, "but it will be done."

The task is large. The Senate Select Committee estimated that the minimum requirement for dealing with the water supply and pollution abatement problems would involve the need for 315 million acre-feet of reservior capacity for river regulation by 1980, and an additional 127 million acre-feet between 1980 and the year 2000. This 40-year estimate of minimum, nationwide storage needs is roughly five times the total water storage capacity built by the Department's Bureau of Reclamation in the 58 years between 1902 and 1960.

The capital costs appear large, too, if the offsetting benefits are considered separately.

The Select Committee estimated that new capital investments of $12 billion would be required by 1980 to build the required minimum

## POPULATION GROWTH IN RECLAMATION STATE



Based on Dept. of Commerce data

storage capacity, and an additional $6 billion by the year 2000, for a grand total of $18 billion. Municipal and industrial sewage treatment works under the same program, which calls for water of relatively high quality in all the nation's streams, would require new investments estimated at $42.2 billion by 1980, and an additional $39.4 billion between 1980 and the year 2000, for a grand total of $81.6 billion.

Required capital investments, therefore, for a minimum program of additional water storage and water pollution control facilities between now and 1980 amount to roughly $3 billion annually, considerably more than is being invested today, even under the accelerated Kennedy Administration program for the fiscal year 1961.

## *Prompt Action by the Department*

The Department of the Interior reacted promptly to President Kennedy's challenge with the following actions in the water resource field:

1. Budgetary requests were initated to provide funds in both fiscal years 1961 and 1962 to accelerate project planning and development, to expedite construction of starts on new, needed water resource projects.
2. Steps were taken to increase both the emphasis on and activity in engineering research, especially that associated with reducing loss of valuable water resulting from waste by evaporation, by transpiration of water—"stealing" weeds and trees, and by seepage losses and other wasteful irrigation practices.
3. Efforts were launched on a broad legislative front to authorize new water resource projects and to spell out new water policy, including an Administration proposal to create a Water Resources Council in the Executive Branch, to prescribe comprehensive planning on a river-basin basis, and to provide grants-in-aid for expanded planning by the respective States.

## *Results in the Making*

Complex water resource facilities cannot be built in a day, or a year, and sometimes not even in decades. But at midyear, concrete results already were apparent in the Kennedy Administration's evolving water resource development program. The 1961 drought and Administration spokesmen were making water resource development a matter of immediacy.

Fiscal year 1961 funds for the Department's Bureau of Reclamation were reprogrammed to provide, within the Congressionally-approved appropriations, additional planning and construction work on needed projects.

This rescheduling permitted initiation of design and specification work leading toward a new construction start on the Red Bluff Diversion Dam, first step toward supplying water for the Tehama-Colusa Canal of the Sacramento Canals unit, Central Valley Project in California, and initiation of advance planning on the Wichita Project in Kansas. The latter is an $18.2 million project to furnish urgently needed supplemental municipal and industrial water supplies to the city of Wichita.

# AGRICULTURAL REQUIREMENTS

## 1980

| | |
|---|---|
| CROP YIELDS | +42% |
| CROP ACRES | +20 Million |
| DOMESTIC & EXPORT NEEDS | +60 to 90% |

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## 2000

| | |
|---|---|
| CROP YIELDS | +75% |
| CROP ACRES | +63 Million |
| CLEARING OF FOREST (acres) not recommended | +73 Million |
| DOMESTIC & EXPORT NEEDS | +90 to 190% |

**Source: Report to Senate Select Committee on National Water Resources, Dec. 1959**

Mid-March revisions in the 1962 budget also resulted in appropriations requests for $900,000 for stepping up project investigations throughout the 17 Western States; funds to accelerate the $96 million Canadian River Project to deliver supplementary water to 11 municipalities in Texas; for moving ahead by two years the delivery of water to the 33,960–acre Ainsworth Unit in Nebraska; for expediting construction of transmission lines in three major river-basin systems, and for other purposes.

*The irrigated farms of the West offer quality foods and fibers, nonsurplus crops, and high-value specialty agricultural products to the Nation. These irrigated acres loom large in meeting our increased food needs of the future.*

In mid-February, design and specifications staffs of the Bureau of Reclamation's Denver Engineering Center went on a 6-day, 58-hour week to speed up contract awards.

First water deliveries were made this spring from the Corning Canal of the Central Valley Project to water users in southern Tehama County in California, and from the new Southside Canal on the 22,000–acre Collbran project in western Colorado.

### *President Proposes Planning Act*

The greatest emphasis to Administration efforts to meet the water challenge and provide sufficient resources for tomorrow came in mid-July when President Kennedy delivered to the Congress his proposed "Water Resources Planning Act of 1961," the most far-reaching water policy legislation sent to the Congress by the White House in many years.

Having an important bearing upon all water and related land conservation and development activities, the proposed Act would

1. Establish a Cabinet-level Water Resources Council. The Council would be the keystone in a comprehensive structure for water resource planning within river basins and would provide overall guidance and standards for planning, consistent with existing law.

2. Authorize the President to create, at the request of the Governor of one or more affected States or of the Council, a river basin water resources commission for any region, major river basin, or group of related river basins in the United States. These commissions, composed of representatives of the States and Federal agencies concerned, would be charged with preparing and keeping up to date comprehensive, integrated plans for Federal, State and local development of water and related land resources. Also they would recommend long-range priorities for basic data collection and analysis and for investigation, planning and construction of projects; and, finally,

3. Provide encouragement to the States to fully and effectively participate in water and related land resource planning through financial assistance to aid in their planning.

This river basin planning would require that any plan take into account domestic, agricultural, energy, industrial, recreational, fish and wildlife, and other water resource conservation and developments. It would enable the Congress—within the Federal sphere of responsibility—to decide upon the many individual project developments on the basis of full information as to the overall needs and timing for basin development. States and local interests—within their respective spheres of responsibility—would be enabled to do likewise.

"We have a national obligation to manage our basic water supply so it will be available when and where needed and in acceptable quality and quantity—and we have no time to lose," President Kennedy wrote the Congress. "The planning authorized by this legislation will provide a vital tool for achieving effective water resources management."

## *Saline Water Conversion*

On June 26, President Kennedy acted to attack the water problem on another front when he forwarded to Congress proposed legislation to expand and extend Federal efforts in the saline water conversion program. "This bill," the President stated in a letter of transmittal, "will provide the Department of the Interior with a wide variety of tools to attack the saline water conversion cost barrier.

*One of the greatest resource challenges of the coming decades is to provide new sources of potable water for a growing America. The Department is constantly seeking new and economical methods for converting sea water to fresh water in plants such as the one above at Freeport, Tex., the first saline-water conversion demonstration plant in the Nation.*

It contemplates a major acceleration of current programs of basic and applied research, and permits the construction of conversion plants far larger than any now in existence to test the feasibility of known and yet to be developed processes."

In September, the Congress responded by passing Public Law 87-295 which authorizes the expanded program and provides for an appropriation of $75 million to achieve its aims.

In mid-1961, President Kennedy participated in cermonies marking the dedication of the nation's first saline water conversion demonstration plant at Freeport, Tex. "This is a work," he said at that time, "which in many ways is more important than any other scientific enterprise in which this country is now engaged. It serves the interest of men and women everywhere. It can do more to raise men and women from lives of poverty and desperation than any other scientific advance."

The Freeport plant is the first sea water conversion plant in the United States capable of producing 1 million gallons of fresh water per day, and the first to regularly supply the water needs of a U.S. municipality.

As recently as the late 1930's, it cost between $4 and $5 to convert a thousand gallons of sea water into fresh.

Since then, equipment, fuel, and labor costs have increased several fold.

Despite these increases, cost of the Freeport product water is presently estimated at $1–$1.25 per 1,000 gallons, including 20-year amortization charges.

Thus it can be seen that important gains are being made in reducing costs. With improved techniques, more experience, and larger plants, it is aniticipated that conversion costs—in the foreseeable future—can be still further reduced to somewhere in the neighborhood of 60 cents per 1,000 gallons.

In addition to the Freeport plant, four other sites have been selected for demonstration plant testing. They are at San Diego, Calif.; Webster, S. Dak.; Roswell, N. Mex.; and Wrightsville Beach, N.C.

During the year, a second plant was completed and dedicated—the 250,000-gallon-a-day facility to desalt brackish well water at Webster, S. Dak.—and work was nearing completion on a million-gallon-a-day sea water desalination plant at San Diego, Calif. At the same time, contracts had been let for design of the New Mexico and North Carolina plants, with work on this construction scheduled to start in the new fiscal year.

### *Other Legislative Efforts*

Throughout the year, a steady flow of legislative reports to the 87th Congress gave the Department of the Interior's endorsement to proposed legislation to authorize additional water resource development projects for the West. These Administration-backed authorization proposals included:

The $135 million Navajo Indian irrigation project and the $86 million initial stage of the San Juan-Chama project in New Mexico and Colorado, to supply new and supplemental water to a total of 231,530 acres of land in the Southwest, including extensive Indian reservation acreage.

The $170 million Fryingpan-Arkansas project to provide supplemental irrigation water to 280,000 acres in Colorado's Arkansas River Valley, and other multipurpose benefits.

The $81.5 million mid-State multipurpose Reclamation project to deliver water to 140,000 acres in central Nebraska.

The $183 million modification of the Garrison Diversion unit of the Missouri River Basin project in North Dakota, which would supply water to an initial stage development of 250,000 acres.

The $45.5 million Burns Creek project, to build a reregulating reservoir and hydroelectric power plant on the Upper Snake River near Idaho Falls, Idaho.

### *The Need for Research*

Research to provide an adequate scientific basis for decision-making is a primary need in solving the practical problems of water-resource management. Water knowledge is needed to establish and maintain scientific hydrology at a level that will assure advances in our understanding of the dynamic processes in nature which affect the occurrence, movement, quality, and usability of water. Without this information, much conservation effort with water, soils, and other resources will be of uncertain value.

The solution of water supply and pollution problems will continue to require the gathering and compiling of basic data, such as the first nationwide compilation of streamflow data by principal drainage basins, recently completed by the Department's Geological Survey. Perhaps of equal economic importance is the series of reports dealing with the frequency and magnitude of floods which, together with a series of flood inundation maps, provide essential data for planning protective works and for proper zoning of flood plans.

This basic research work of the Geological Survey ties in closely with the saline water program. Its studies on water quality and water resources help to determine areas where saline water conversion might be considered in the foreseeable future.

### *Reduction of Water Losses*

During the fiscal year, the Bureau of Reclamation vigorously pursued an intensified program of engineering research aimed at reducing losses of valuable water from evaporation, transpiration of water-stealing phreatophyte plants and weeds, seepage losses, and other causes.

The second in a series of major cooperative field experiments with methods of reducing water losses due to evaporation by use of chemical monolayer films was conducted during the year on Sahuaro Lake in Arizona.

Participating in the experiment were engineers and scientists of the Bureau, the Department's Geological Survey, and the United States Public Health Service.

Sahuaro Lake, site of the test, is a 1,260-acre reservoir behind Stewart Mountain Dam on the Salt River Reclamation Project near Phoenix, Ariz.

The experiment showed reductions in water losses attributable to evaporation of approximately 14 percent for the period of October 1–November 17, 1960, and savings of about 22 percent for the October 19–November 17 period when maximum coverage was employed.

The first major field experiment was conducted in 1958 on the 2,500-acre Lake Hefner—a reservoir serving the domestic needs of Oklahoma City—and effected savings of about 9 percent in water losses from evaporation.

Additionally, research contracts in this field were executed in the 1961 fiscal year with Columbia University and with the Desert Research Institute of the University of Nevada. Thus action is being speeded to reduce as rapidly as possible the water evaporation losses in the West which now total about 25 million acre-feet per year.

At the same time, the Bureau of Reclamation announced that its research and development work in low-cost canal linings during the past 15 years have contributed to total savings to western water users of more than $20 million in the construction of irrigation canals. Results of this program demonstrate that use of such linings can reduce annual canal seepage losses in the foreseeable future by an estimated 1.5 million acre-feet of water.

### *Moving To Meet the Challenge*

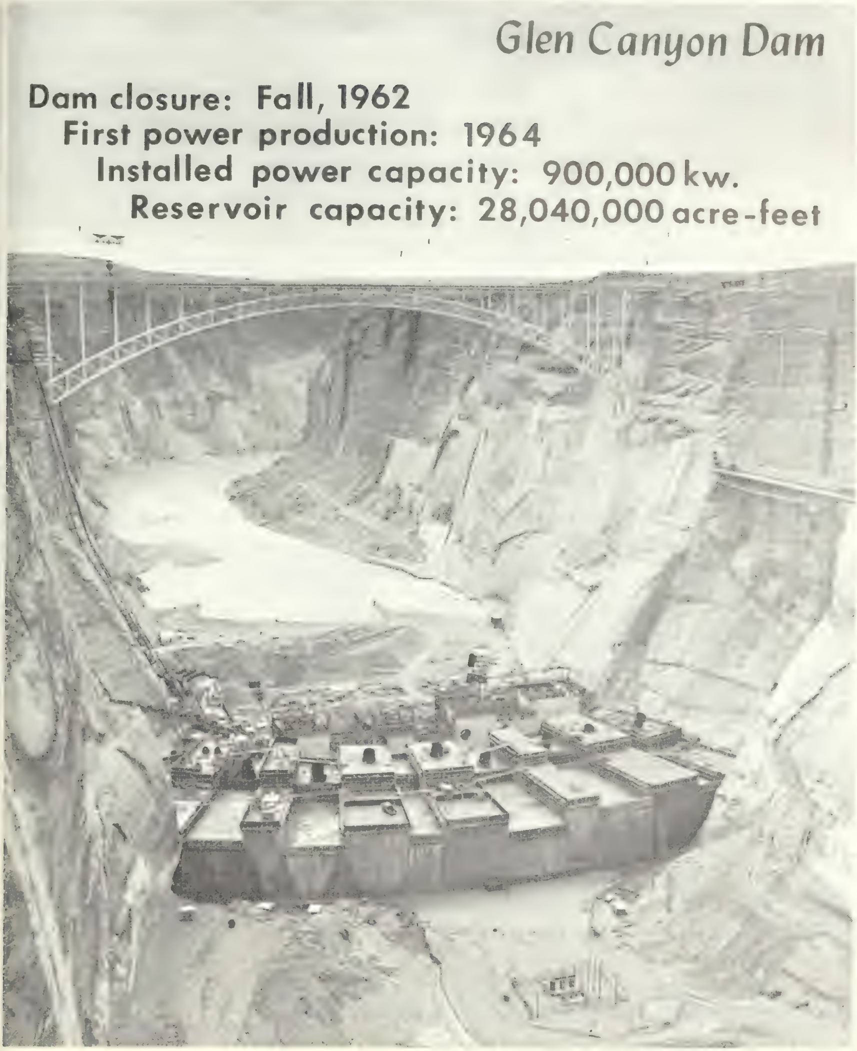
Thus on many fronts the Department of the Interior is moving at a greatly accelerated pace toward solutions to the water problems which, unmet, could threaten our national development and progress in the years ahead.

## *Development of Our Hydroelectric Reserves*

A major key to continuation of this Nation's vast industrial development—indeed to the preservation of its basic strength—lies in our ability to find ways of developing sufficient electrical capacity to meet the enormous future needs.

Accordingly, early in 1961, the Secretary of the Interior outlined a broad new power policy for the Department calling for a vigorous program of full development and maximum utilization of our total energy resources.

The need for such action may be seen in an examination of the supply and demand relationship in the area served by only one of


Glen Canyon Dam
Dam closure: Fall, 1962
First power production: 1964
Installed power capacity: 900,000 kw.
Reservoir capacity: 28,040,000 acre-feet

the great hydropower projects under construction by the Department's Bureau of Reclamation—the Colorado River Storage Project.

Bureau of Census projections show an increase in population of the four Upper Colorado Basin States from 3.9 million in 1960 to 6.4 million by 1980, an increase of 64 percent. At the same time, the Federal Power Commission projection of power needs for these States shows a requirement of 66,737 million kilowatt-hours in 1980, compared with 15,242 million kilowatt-hours used in 1960. This represents an increase of 337 percent in less than two decades—more than quadrupling the 1960 requirements.

## *Linking Forces*

Obviously, the hydro plants of the Colorado River Storage Project cannot fill in all of this vast growth—nor can any single public or private utility.

Consequently, the Departmental policy placed emphasis on the need for maximum effort by all utility systems—Federal, State, municipal, private, and cooperative—in the interest of the public welfare.

Two of the major aims of the new policy are:

1. Enlarging regional cooperative pooling of generation and transmission facilities, and,
2. Planning for the early interconnection of areas served by Department marketing agencies with adequate common-carrier transmission lines.

A first important step toward achievement of these aims came during the year when the Department's Bonneville Power Administration, the U.S. Army Corps of Engineers, and nine private and public owners of hydroelectric generating facilities signed a coordination agreement designed to maximize power production at existing powerplants on Pacific Northwest rivers.

The agreement provides that storage and generating facilities on Pacific Northwest rivers shall be operated in much the same manner as if all were under one ownership.

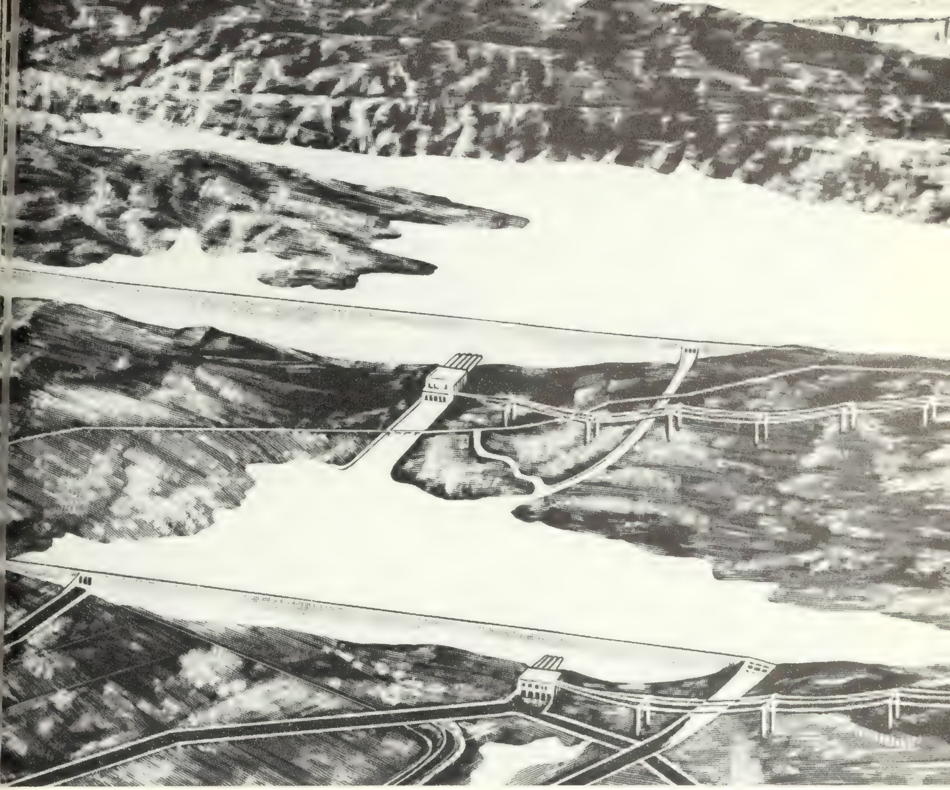
It also provides for interchanges of energy and power among the signers in order to conserve water in reservoirs, and for coordination of the transmission facilities of the parties to the agreement.

Informal coordination in varying degrees prior to the signing of the agreement had resulted in approximately 1 million additional kilowatts. A substantial added number of firm kilowatts is expected to result from the agreement.

## *Intertie Study—A Part of Linking Forces*

Another important step toward implementation of the Department's more vigorous power conservation and development policy was taken early in the year with appointment of a departmental task force to study the feasibility of a proposed extra high voltage common carrier power intertie between the Pacific Northwest and Pacific Southwest.

In a preliminary report on its findings, delivered in May, the study group indicated that the proposed intertie holds considerable promise of mutual benefit to both areas, by taking advantage of the diversity of loads, coordination of thermal and hydro plants and disposal of power surpluses during certain periods.



*Artists rendition shows graphically the dynamic essentials of pumped back storage of water to gain maximum hydroelectric potential. Off-peak power, which otherwise sells at low rates, is used to pump water to a storage reservoir to gain more peaking power when economic value of the electricity is higher.*

From a strictly engineering viewpoint, the report said that technology of extra high voltage transmission lines in the United States is "sufficiently advanced so that lines up to and including 500 kilovolts can be constructed without delay." The United States now uses lines up to 345 kv., but few at that voltage.

### *Study by Joint Committee*

In April, 1961, the Secretary of the Interior appointed a committee to join with representatives of the Edison Electric Institute in studies designed to determine where the pooling of private and public power production would serve the national interest.

As the result of Federal initiative in this matter, the Institute in September announced a 10-year program of transmission line construction which could well open the way for a major cooperative planning effort of interconnecting and pooling facilities of public systems with those of private industry. At the same time, the action can represent the forerunner to the logical next step—a cooperative industry-governmental effort to plan for the full utilization of the present and future facilities of private industry, consumer-owned utilities, and the Federal Government.

### *Treaty with Canada*

Typical of the programs which the Department has supported to increase power development while at the same time promoting resource conservation for the future is the treaty with Canada under which the Arrow Lakes, Mica Creek, and Duncan Lake dams will be built on the upper Columbia River. These three dams, together with Libby Dam to be constructed in Montana, would provide additional storage for the heavy spring and summer runoff of the Columbia River system.

The treaty requires full coordination of Pacific Northwest storage and electric generation to get the most power production out of the Canadian storage to be provided under terms of the treaty. Canada is to receive 50 percent of all the additional power that can be generated downstream in the United States because of this storage. Ratification of the treaty is pending in Canada.

With the three Canadian dams and Libby Dam in full operation over 2 million kilowatts of firm power would be added to the Federal system in the United States.

A significant fact concerning this program is that it is designed to conserve an important renewable but presently wasted energy resource.

Through the years, such losses nationally have been on an almost incredible scale. For example, in the calendar year 1961, some $30,000,000 worth of electric energy will be wasted over the spillways of Columbia River Federal dams because of the present inadequacy of transmission lines to market areas.

In many ways, the Department of the Interior is acting now to curb this wastage of a vital resource and to assure that our total supply of electric energy will be adequate to meet tomorrow's needs.

## *A "New Trail" for the American Indian*

Shortly after the election in November 1960, President-elect Kennedy set forth the mandate on which his Administration is basing a determined effort to help our Indian citizens take their rightful place in the nation.

*Indian students in Bureau schools learn about democracy in action by participating in class elections.*

President Kennedy stated:

"We want every group which is now unable to make its full contribution to American strength to be given the opportunity to do so. It is in this spirit that we shall approach our work on Indian reservations, and it is in this spirit, I am sure, that Indians throughout the country will work together for a better life for themselves and thus a stronger America."

As the Federal agency primarily responsible for carrying out this Presidential mandate, the Department of the Interior has embarked on a top priority program designed to provide self-sufficiency for the Indians as rapidly as possible, within the protection guaranteed them by history.

In February 1961, a special task force was appointed by the Secretary of the Interior to make a thorough study of the problems and programs affecting the lives of the 360,000 Indians still living on reservations, and the some 160,000 living in other areas, and to put forward recommendations looking toward "a better life" for these Americans.

In July, the task force—after travelling 15,000 miles and conferring with the representatives of 200 organized tribes—completed its report. The comprehensive document recommended programs and actions designed to blaze a new trail in Indian development.

In the introduction to its report, the special study group, composed of well-known experts in Indian affairs, had this to say:

"During the 90 years which have elapsed since the United States Government ceased to make treaties with Indian tribes, Congress has appropriated millions of dollars to finance its programs for the protection, subsistence and acculturation of this relatively small group of Americans . . .

"From time to time during these 90 years, critics of the Federal Indian program have raised the question of how long the Government must continue its special relationship with Indians. Underlying their concern has been an awareness of the accelerating cost of the program, a belief that to provide special services for Indians places them in a privileged category, and a contention that, because of excessive paternalism, the Federal program prevents Indians from achieving their maximum degree of self-sufficiency.

## *'A Certain Justification'*

"An examination of the history and present status of Indian affairs reveals a certain justification for the reservations which these critics have expressed. Annual direct expenditures by the Federal Government for its services to Indians have risen from slightly over $7 million in 1871 to more than $160 million in 1961. Many treaties and hundreds of Federal statutes qualify Indians for services in the fields of health, education, welfare, banking and land management which are not available from governmental sources to any other group of Americans. Furthermore, the administration of these services has often been characterized by a paternalistic emphasis which has fostered continuing Indian dependence . . .

"Yet, even those who are most eager to end this special relationship are troubled by the fact that the bulk of the reservation Indian population is less well educated than other Americans, has a shorter life span, and has a much lower standard of living . . .

"What we are attempting to do for those in the underdeveloped areas of the world, we can and must also do for the Indians here at home. Furthermore, to insure the success of our endeavor, we must solicit the collaboration of those whom we hope to benefit—the Indians themselves. To do otherwise is contrary to the American concept of democracy. Basically, we must not forget that ours is a program which deals with human beings. We must have faith in their abilities to help themselves and be willing to take some risks with them."

## *The Role of Government*

In its concluding statement, the task force report declared—

"Much of the progress which the Indians have made has occurred during the past 40 years. They have been considered citizens only since 1924 and, in Arizona and New Mexico, their right to vote was not confirmed in the courts until 1948. Statutory authority for the organization of tribal governments was provided by Congress just a little over 25 years ago, and Indian youth have been drafted for military service only since World War II.

"The events of these past 40 years have done much to make Indians aware of the fact that they cannot alone decide the kind of future world they will inhabit. Furthermore, their experiences have shown them new ways of making their lives more secure and comfortable Now, the desire of many for better incomes, more formal education, better health, and more voice in their own affairs rivals their desire to retain older ways.

"The task force believes that in the foreseeable future, the proper role of the Federal Government is to help Indians find their way along a new trail—one which leads to equal citizenship, maximum self-sufficiency, and full participation in American life. In discharging this role, it must seek to make available to Indians a greater range of alternatives which are compatible with the American system, and where necessary, to assist Indians with choosing from among these alternatives. As a part of this responsibility, it must mobilize and direct the vast reservoir of good will toward Indians which is found throughout the country.

"Finally, since many of the problems relating to Indian development are local problems, it must use its influence to persuade local governments, as well as those who live near Indian reservations, to recognize their stake in the Indian future and to work with the Indians and with the Federal Government in preparing the new trail."

*The American Indian has learned that through conservation he can put to work his natural and human resources for the betterment of his people.*

## *Action Speeded on Recommended Programs*

The recommendations of the task force in regard to programs for Indian progress were promptly made a part of the Department's official policy. These programs are designed to provide better housing, better health, more income, more education, better training, more and better opportunity for steady work at better wages, and the maximum development and use of natural resources on the reservations. Already important forward steps have been taken toward achievement of these aims.

The following are some of the problems toward the solution of which active efforts are in progress:

During the past 30 years—through tribal and individual enterprise and with practical help and technical guidance from the Department's Bureau of Indian Affairs—considerable development of physical resources in the Indian country has taken place. If we regard the 53 million acres of Indian land that is in trust or restricted status as a whole unit, it is safe to say that far more income is being produced from this unit today than was the case 30 years ago, or even 10.

But it is also clear that the potential of these 53 million acres has never come anywhere close to fulfillment.

The existing land base could be much more profitably utilized if t were worked by its Indian owners instead of being leased, as it is o often, to non-Indian tenants. In addition, several hundred thouand acres of additional land have irrigation potential but have not yet been brought under ditch. Continuing progress on this front is ssential for two reasons: First, to improve the economic well-being of the Indian landowners; but also, to safeguard the valuable water rights that go with the land under various laws and court decisions, both of the Federal Government and of the States. The Department s pressing ahead vigorously toward solutions in these areas.

## *Other Fields of Action*

In further response to the Presidential mandate for action leading toward a better life for American Indians, the Department is pressing forward rapidly with timber inventories on the commercially important Indian forest lands. The purpose is to provide better information on which to base cutting schedules. Forest inventories have now been completed on about three-fourths of the area. Inventories pay for themselves not only in planning but eventually help increase Indian income. Present indications are that the annual cut from Indian forested lands can eventually be increased by somewhere in the neighborhood of a hundred million board-feet above the level in recent years without injury to the basic forest.

Some tribal groups are favored by nature with rich deposits of oil, gas, and other minerals which have recently been discovered, are being commercially developed, and are producing substantial tribal income. As a part of its effort to improve the welfare of the Indians, the Department has under way a full program of resource development which will provide for the use of the best modern techniques in minerals exploration and development throughout the entire Indian country.

As mechanization and automation have moved into farming and ranching the opportunities for seasonal unskilled labor become smaller every year. This hits the Indian worker harder than others. The Department is in the process of developing a number of related programs to meet this growing problem.

One of the methods is the use of special inducements—such as plant sites, facilities, and on-the-job training programs—to bring manufacturing employment to the reservation areas. In a small number of reservations, there are programs of this type, but it is the Department's aim that this activity be substantially and swiftly increased.

A depressed reservation area can be improved by bringing individual Indians into contact with areas of greater opportunity. This means education in the broad sense; it means vocational training; it means job placement; and for those who wish it, it means relocation.

## *Educational Problems*

The Department feels that it should be a source of concern to all Americans that after many years of educational efforts on behalf of the Indians, adult Indians living on reservations remain, on the average, only half as well schooled as adults elsewhere. Our failure to achieve better results in educational programs also is reflected in the large numbers of Indians who have no occupational skills; and this lack is in turn reflected in grim statistics of poverty, delinquency, and dependency.

We, as a people, face a major challenge in schooling and in vocational preparation of the Indians. We are still short 5,000 classroom seats to accommodate children of school age who are not now enrolled in any school—State, Federal, or private. We need to relieve the serious overcrowding which has developed in many of the schools presently operated by the Department's Bureau of Indian Affairs. We need to replace obsolete and dilapidated structures with up-to-date facilities. A good start already has been made, but with the population growth that faces us on the reservations, we have a major challenge in this area alone. We also must work continuously to improve the quality of classroom instruction. As one example, the children who come from non-English speaking homes have special needs which have not been met in the past, but which must be met. In all of these matters, the basic aim is to insure that the present and future generations of Indian children receive the same educational advantages, the same educational opportunities as other children throughout the country. It is not a simple problem, and it is a very important one.

Adults beyond school age also have an intensive need. Many adults on the reservations have had little or no formal schooling in their youth. They need an educational program suited to their special situation, and Federal programs are being carried out in this direction.

The leaders of the next generation will need to be college graduates trained in specialized schools of many kinds. But such schools accept only high school graduates; and the dropout rate of Indian youngsters in high school is very high. Programs are required to make certain that we are not losing potential leaders through high school dropouts, and to assure that more scholarship aid is available for Indian high school graduates.

In all of these educational problem areas, the Department of the Interior, under the stimulating and sympathetic leadership of President Kennedy, has in this fiscal year made progress of an encouraging nature. This progress has been greatly facilitated through following the guidelines laid out in the Indian task force report.

One of the most encouraging forward steps has been in the field of adult vocational training. In the first session of the 87th Congress, legislation was approved providing for the training of more adult Indians in vocational schools and more on-the-job training in industrial plants. This program will be increased as rapidly as possible to at least twice its present size.

## *An Important First Step in Housing*

Intertwined with all programs of human and natural resource development for the American Indian is the great need for improved housing on the reservations. In its report, the task force, with careful deliberation, used the phrase "truly shocking" to describe the housing conditions it encountered in its studies.

Throughout past decades, Federal assistance has been provided for public housing in many forms throughout the nation. But prior to this Administration, no such assistance had been available in the Indian country.

Thus, another important step in blazing a new trail for the American Indian took place in September when President Kennedy took part in a Housing and Home Finance Agency ceremony by which the first application for a public housing project on an Indian reservation was approved. Following this first step, priority status has been assigned by the Department's Bureau of Indian Affairs to the development of further housing project applications as rapidly as possible.

## *Progress Toward the Goal*

From these highlights, then, it can be clearly seen that President Kennedy's desire to speed the development of the human and natural resources of the Indian reservations has already produced the first steps in a considerable betterment in the Indian way of life.

Obviously, much remains to be accomplished.

But the machinery has now been set in motion which will assist the some half-million Indians both on and off the reservations to bridge the gap now separating them from full participation in the benefits and challenges of present-day American life.

## *Developing the Potential of Our Public Lands*

For 175 years, the public domain has furnished lands and natura resources to help meet the needs of a growing nation. More than half of the public domain has been taken over by private citizens—to settle develop, and use.

Although no longer used primarily for settlement, the vast remainder of our public domain has a variety of vital uses, which become increasingly important and highly competitive as our population increases and gradually shifts westward.

Today, more than 168 million acres of the national land reserve plus 309 million acres of other Federal lands could and should be developed, improved, conserved, and utilized under aggressive Federal land and resource management. During this fiscal year, the Department of the Interior has instituted vigorous actions toward this end.

Our remaining public lands still offer present and potential natural resources of inestimable value—timber, outdoor recreation, forage, coal, oil, and minerals—all important resources of tomorrow. But the problem is to assure—through sound and orderly management—that the resources will be there when they are needed tomorrow.

Immediate steps must be taken to restore and improve the productivity of millions of acres that have been ravaged by floods and winds, or exhausted through overuse. Renewable resources must be managed on a sustained yield basis. Nonrenewable resources must be extracted without waste—and with particular concern for soil and water conservation.

Because of the proximity of much of the public domain to expanding western cities and communities, it is inevitable that demands will increase for public lands for urban and business development, and for outdoor recreational facilities.

### *Moratorium Ordered To Improve Administration*

Immediately upon taking office in 1961, the Secretary of the Interior was confronted with an overwhelming backlog of incompleted applications for public lands, many of them filed 3 and 4 years previously. As a result, the Secretary ordered an 18-month moratorium on most types of nonmineral applications and petitions for lands of the public domain.

Not affected were applications filed prior to the moratorium. Also unaffected were petitions from State and local governments, applications and offers under the mining and mineral leasing laws, and scrip rights and settlement claims in Alaska.

*Public domain lands of the United States offer recreational potentials to meet the increasing needs of State and local programs.*

Reason for the backlog was a continual deluge of thousands of applications, often the result of duplicate filing and other questionable practices of some land locators and speculators.

These and other practices consumed valuable processing time, and cost the American public millions of dollars. Tasks of processing were made more arduous by the lack of a precise inventory of remaining tracts and areas of the public domain, and the statutory need for adhering to certain antiquated and frequently ambiguous public land laws and other regulations.

The moratorium allows time for three critical activities by the Department:

First: to eliminate the backlog of applications.

Second: to conduct a comprehensive inventory, evaluation, and classification of public lands; and,

Third: to review and revise regulations of the Department, and to initiate legislation proposals necessary to modernize and streamline the nation's land laws.

## *Inventory and Classification*

Only through knowledge of the characteristics and capabilities o our remaining public lands can their best ultimate usage and prope management of the Nation's estate be achieved. To provide thi information, the Department's Bureau of Land Management is conducting an inventory, evaluation, and classification of the nationa land reserve.

Areas are being classified for many uses—for urban development public outdoor recreation, forestry, mining, wildlife, grazing, an other purposes, often in combination.

This—the first program of its kind—represents a significant ste toward better Federal land management and improved conservatio of our natural resources for tomorrow.

## *Administration of Land Laws*

An important program for utilizing the lands of the public domai involves the administration of Federal land laws by the Department

Under these laws, ownership of more than one billion acres o public lands have been transferred to State and local governments and to private individuals, during the past 150 years.

Still in effect today are more than 5,000 laws pertaining to the disposition of public lands. Many of these laws are throwbacks t the 19th century, and today are obsolete, impractical, and antiquated.

As a first and significant step toward rectifying part of this problem of archaic land laws, the Department has recommended to Congress the enactment of a single land-sale law to replace about 30 old laws dating as far back as 1877. Other legislative proposals of this type will be made in future months.

## *Balanced Use*

To achieve productivity and also satisfy conflicting demands for use of certain areas of public lands, a revitalized program of balanced usage is being developed by the Department's Bureau of Land Management.

Balanced usage is essentially the best and most effective use of the available resources of public lands—mitigated by the total availability of these resources regionally and nationally, the conservation of resources for future utilization, and a reconciliation of conflicting demands for current use of the lands.

Conservation is not hoarding. It is the full, judicious, and balanced usage of our natural resources, dominated at all times by the need to end waste.

Broad programs for soil and moisture conservation are currently concerned with correcting soil erosion and water losses that sometimes occur in parts of the public domain, particularly on Federal range lands west of the Rocky Mountain region.

Revegetation—through seeding and planting—of eroded lands is doing much to improve the forage capacity of public lands used by livestock and wildlife.

In some instances, new soil areas are being substituted for older, overused areas. The fertility of good acreages is being revitalized, and that of poor acreages being reestablished, by better tillage techniques, adequate use of fertilizer, and other measures.

General responsibility for the care and conservation of public lands includes continuing programs for the protection of natural resources from trespass, fire, insects, disease, and other depredation. Facilitating this work, more than a thousand miles of access roads are maintained annually throughout the nation.

Our extraction processes for minerals, timber, and other products of the soil are often wasteful. Increased productivity now requires modern and more effective extractive methods. Such methods are now being studied and developed as rapidly as possible by the Department.

### *Forest Resources*

Of all our efforts to conserve vital natural resources for tomorrow's needs, our forest lands present the sharpest challenge to our foresight. This can be realized more clearly when we consider that the trees we plant today will not reach the minimum sizes needed for lumber until the year 2000. Yet, somehow, we must be prepared to meet a projected doubling of our current lumber consumption within 40 years.

President Kennedy, in his special message to the Congress on natural resources, took cognizance of this problem when he said:

"At present cutting rates, we are using up our old growth timber in Western stands. Because of the time requirements involved, we must move now to meet anticipated future needs, and improve the productivity of our nearly 500 million acres of commercial forest land."

Of these 500 million acres the Department has responsibility for approximately 52 million acres as well as for an additional 131 million acres of noncommercial forest lands.

The Department has initiated a five-point program to place its forest lands in condition to meet their proportionate share of the Nation's goals in the year 2000:

*The national land reserve, under scientific sustained-yield management, can provide an important portion of the timber resources of the future.*

1. Provide adequate protection from fires, insects and diseases.
2. Identify specifically those public domain lands which should become a part of the national land reserve for forest management.
3. Complete the network of access roads required for protection, for the removal of forest products and for recreation.
4. Provide for the early reforestation of over 1 million acres.
5. Improve the quality of the growing stock within over 2 million acres.

## *Joint Action To Meet the Challenge*

In his message, the President called upon the Secretaries of Agriculture and the Interior to coordinate programs and policies of their agencies for improved management of Federal forest lands looking toward greater productivity without diminishing the basic resource.

The two Departments have undertaken an intensive joint study of existing timber sale and management practices, and, in midyear, adopted the broad recommendations of the study group designed to achieve closer uniformity in these practices.

Among the recommendations adopted were orders to the agencies nvolved within the Departments to standardize management plan nventory procedures, and to reconcile differences in determining allowable timber cut.

Other recommendations included possible adoption of a joint nursery program, and action to meet land jurisdictional problems in he complicated checkerboard ownership areas of Western Oregon.

Additionally, by Presidential directive, the two Departments acted n concert during the year to accelerate the building of access roads to public forests in a move aimed at making additional supplies of merchantable timber available to small businesses.

While recommendations of the joint study group apply primarily to Federal forest lands in Western Oregon, some idea of the scope of the agreement may be seen in the fact that the six national forests in Western Oregon, under jurisdiction of the U.S. Forest Service of the Department of Agriculture, embrace approximately 6.3 million acres from which some 1.8 billion board feet of timber are harvested each year; while the Department of the Interior's Bureau of Land Management has the responsibility for about 2.5 million acres of Federal lands in 18 Western Oregon counties which produce more than 1 billion board feet of timber annually.

Additionally, this Department's Bureau of Indian Affairs is responsible for some 2.1 million acres of commercially valuable Indian-owned forest lands in the Pacific Northwest, producing nearly 400 million board feet of timber a year.

## *Range Resources*

About 160 million acres, or half of the public lands in 10 Western States, are used primarily for raising livestock. Although much of the region is arid and mountainous, there is enough moisture to grow some vegetation. But for the most effective use of resources of the Federal range, there must always be sufficient grass and forage to feed livestock and wildlife.

Whenever too many cattle, sheep, or wildlife roam the range, vegetation suffers. And without plant cover, the rich topsoil washes away, and erosion ravages the terrain. In a few years, there are vast areas of devastation, vacant of vegetation and topsoil. Each year, thousands of tons of topsoil are washed down major rivers of the West.

Exactly in this way, more than 100 million acres of our public lands have been allowed to deteriorate during past years.

*Aggressive programs of range management are needed to prevent the continue deterioration of public grazing lands.*

Toward a solution, a new start is necessary—with a more aggressiv program of Federal range management to put a stop as rapidly a possible to this enormous waste.

During 1961, the Department devised and began work on a progran designed to achieve this end. The program proposed—in total—i both sweeping and costly. But it is also necessary that it be pressed forward without delay. It will take decades to reclaim and restore many of the devastated areas.

After inventory and evaluation of critically affected areas of the Federal range, the program features an accelerated restoration of durable plant cover—by seeding, planting, and proper management.

At the same time, soil and moisture conservation projects are being used to regulate run-off from watersheds, and divert water to critical areas.

### *Guarding the Heritage*

The wealth of the public lands—with their forests, ranges, minerals, recreational potentials—is an important segment of our national heritage. Such wasteful inattention to this vital resource as that which permitted 100 million acres to become useless and denuded has in the past constituted what amounts to a national disgrace. Through the vigorous new conservation programs being instituted by this Administration, the tide is being turned and the riches of our lands are being not only guarded for today, but enhanced for the future.

## *Minerals and Fuels for Tomorrow*

Planning for the development of mineral resources to meet tomorrow's needs embraces both a short and a long-range view. To those who must decide how and where Governmental efforts will be directed, the future consists of two tomorrows.

First, there is a tomorrow that is almost here—a future that can be predicted with some certainty. This period, comprising the immediate years ahead, can, for convenience, be called "Tomorrow—1970." Its problems in resource conservation are known—or can at least be anticipated—and, for the most part, they entail keeping abreast of relatively gradual changes.

There is also a more distant tomorrow—the year 2000 and beyond—for which mineral requirements and possible ways of fulfilling them must be appraised now.

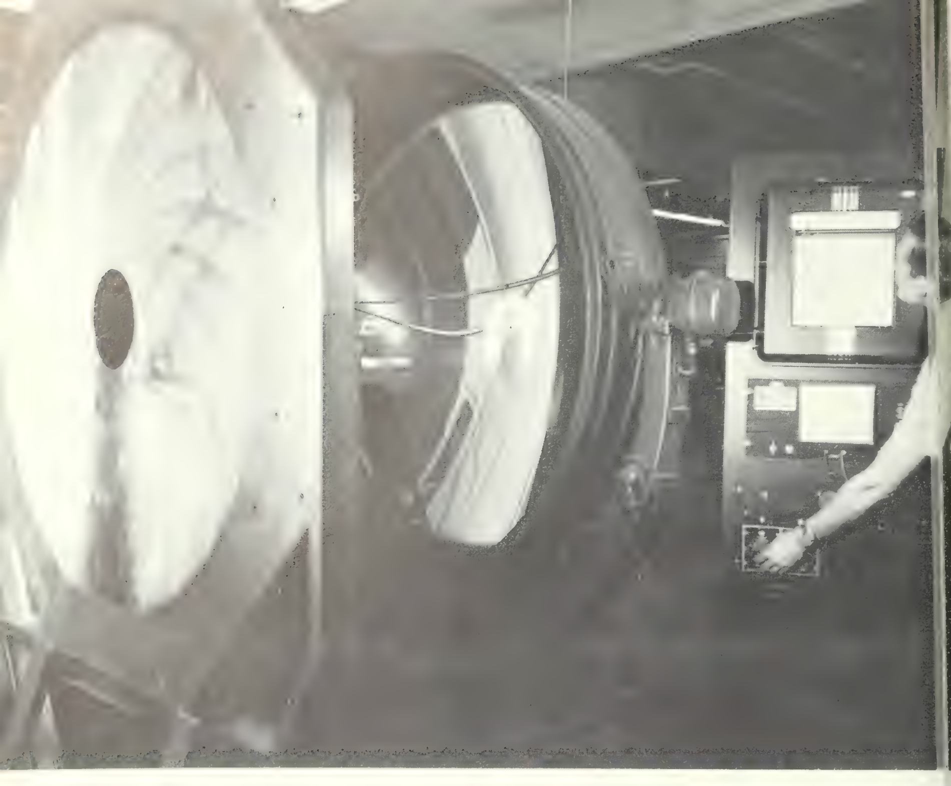
The future cannot be forecast with scientific precision. Therefore, programs must be both dynamic and flexible. They must be subject to continual review, and they must be revised as frequently as necessary in technological, economic, political, or social conditions.

The total environment in which the mineral industries will operate is expected to change only gradually within the next 10 to 20 years. International tensions may well continue, the nation's population and its economy should expand steadily, and its standard of living undoubtedly will keep rising.

Costs of discovering, extracting, and processing minerals will increase, as will the costs of research, but probably not enough to cause dramatic changes in technology.

### *Raw Materials: An Imperative Need*

An unsettled and highly competitive international situation, combined with the pressures generated by a steadily growing population



*Today's expanding requirements for metals capable of resisting the extreme hea of space travel result in new high-temperature research by the Department of the Interior.*

and more complex economy, make it necessary that the United States continue to have adequate supplies of minerals and fuels to meet its expanding needs.

We live in an age of phenomenal technological progress. There seems to be virtually nothing that science cannot give mankind, and of late her gifts have been many and diverse. However, each advance, each forward step of science, almost invariably creates additional demands for metals, nonmetallics, and fuels.

Realizing that minerals are essential to progress, the Department of the Interior has, during the fiscal year just closed, intensified research on mineral raw materials. To begin this expansion, the Congress, during the year appropriated additional funds for the Department's Bureau of Mines to finance intensified studies in this important area.

Through these studies, the Department is seeking high-purity metals with special properties that will withstand extreme conditions encountered by high-speed aircraft, missiles, and space vehicles, or which will perform reliably in tomorrow's nuclear power plants and complex electronic computers and guidance systems. At the same time, other Bureau of Mines scientists are working to develop new synthetics that will equal or out-perform natural minerals.

This work may well lead to establishment of entirely new industries, in the same way that Departmental research opened the way for commercial production of titanium and zirconium.

## *Improvement of Extractive Processes*

Investigations to improve extractive processes also are being stepped up, both to broaden our domestic resource base and to keep mining and processing costs down. These studies will gain added impetus during the coming year when the Department acquires 155,000 curies of Cobalt-60 from the Atomic Energy Commission. This gamma ray source—one of the largest in the world—will enable researchers to evaluate radiation as a means of speeding mineral-extractive processes and of altering the properties of minerals and mineral fuels.

To insure adequate supplies of traditional raw materials, the Bureau of Mines is intensifying research on methods of producing iron, copper, lead, manganese, clays, and other materials from low-grade resources and from deposits lying at depths too great for economic recovery under present conditions.

## *Helium Conservation*

One of the most important and dramatic conservation developments of the year came with the launching by the Department of its new helium-conservation program.

The program, climaxing many months of study and careful planning, is a cooperative undertaking by Government and industry through which privately built and operated plants will capture helium from certain natural gases destined for fuel markets.

Underlying the urgent need for this conservation effort is the fact that the equivalent of a year's supply of helium now is lost every 45 days. If such waste were permitted to continue, the Nation's limited helium reserves could not be relied upon to supply anticipated national requirements beyond 1985.

The new program provides for recovering and storing for future use 52 billion cubic feet of helium which otherwise would be wasted when natural gases containing this valuable element are burned for fuel.

The Department began negotiations with private firms in March 1961, shortly after enabling legislation for the program became effective, and during the year contracts were awarded to four private

*One of the major new conservation programs of the Department of the Interior deals with the saving of some 3 to 4 billion cubic feet of helium which is now wasted as natural gas goes to market. Helium, a critical resource, is used in a wide variety of military, industrial, space, medical, and research activities.*

companies covering the entire $47.5 million annual contracting authority made available by the Congress.

## *Phenomenal Growth in Demand*

Demand for this second lightest of the elements has grown phenomenally within the past decade.

Lightness, inertness, and super-fluidity have made helium a versatile aid to American industry, which uses it in many different processes ranging from shielded-arc welding and the growing of semiconductor crystals to quality control tests for air conditioners, refrigerators, and missile components. The element also plays essential roles in the Nation's nuclear-energy and space programs.

Perhaps the most promising use of helium is as a liquid whose extreme coldness (−452° F.) enables scientists to enter the realm of absolute zero. At this temperature, where molecular action virtually stops, researchers in the field known as "cryogenics" are uncovering new facts about the properties and behavior of a wide variety of materials. With liquid helium to help them, they are probing deeper into the mysteries of life and death.

Applications for helium for this use and others are expanding so rapidly that the Bureau of Mines estimates some 36 billion cubic feet of helium will be required for domestic use within the next 25 years.

The Department's new conservation program will insure that all essential demands are met and that large quantities of helium are placed in storage for use as needed in the future.

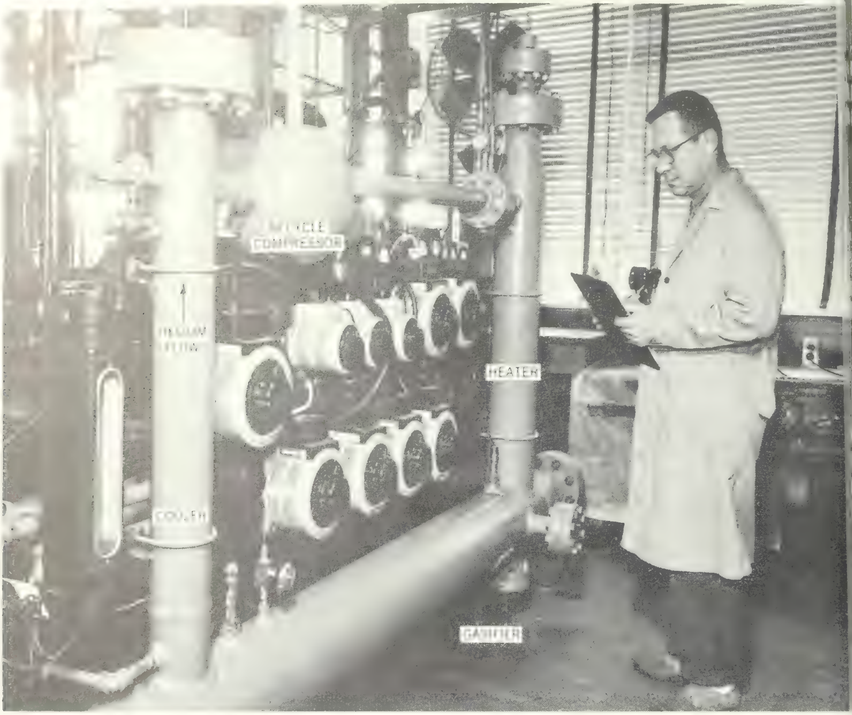
## *Tomorrow—2000*

By the beginning of the next century, the complex of factors influencing, and depending upon, effective utilization of mineral resources shall have changed markedly.

If the present trend continues, the population of the United States will be approximately 300 million. In some parts of the world, there may literally be "Standing Room Only."

This growth in population may well be accompanied by significant changes in national economies and international relationships. Technology, too, shall have altered tremendously. In short, those changes that are foreseen as being gradual over the next two or three decades will culminate 40 years from now in conditions decidedly different from those of today.

In 2000 A.D., man will be mining the earth at far greater depths than now—and perhaps the ocean and the air as well. The prospector will require devices which can detect deposits far beneath the earth's crust, and tell him directly and accurately how much of which minerals are there. The miner will need vastly different methods and equipment that can withstand, and perhaps utilize, high temperatures and other adverse conditions which will be encountered in workings miles below the surface. The metallurgist must have at hand techniques which will permit recovery of minute values from extremely dilute solutions such as seawater.

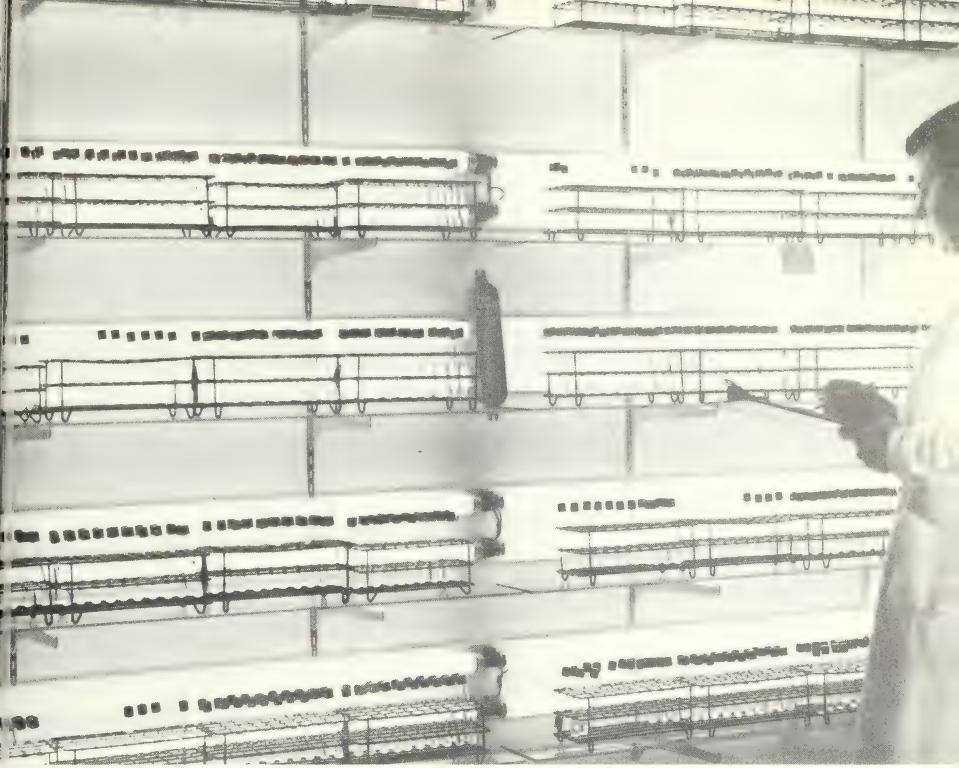


*One of the natural resource challenges facing the Nation is the search for substitute resources. The Department is working diligently on the transformation o abundant resources of coal into synthetic gas for home and industry.*

The energy picture also shall have undergone a drastic change. New sources such as nuclear power, fuel cells, and perhaps solar energy will be helping conventional fuels supply an enormously larger market. Through synthesis, substitution, and transmutation, science will have to provide those materials which no longer are available in natural form or which may have become too expensive to produce by conventional methods.

This second tomorrow is remote. Nevertheless, it is inevitable, and only by trying to visualize it as realistically as possible by extrapolation of known circumstances can we prepare for it. The fate of our civilization—and that of the entire world—may well depend upon our readiness.

The Department is preparing to help meet the vastly increased mineral requirements of the future by steadily strengthening its basic research and resource appraisal programs.



*The secrets of nature and nature's resources require painstaking scientific research in the laboratories of the Department of the Interior.*

## *Basic Research—A Fund for the Future*

Tomorrow's technology will grow out of today's basic research. The scientific marvels of the present—jet propulsion, atomic energy, rocketry, and similar modern miracles—have been derived from the basic research of the past.

World War II and the sustained technological drive which followed it have in a period of years heavily depleted the reserve fund of unused basic research data accumulated through generations of fundamental investigations. Replenishment of this reservoir to support the advances in mineral technology which the future will require has been a major objective of the Department in 1961—and shall continue as a high priority in the years ahead.

Today's basic research by the Department's Bureau of Mines covers a broad range of subjects and scientific disciplines and utilizes the latest techniques and equipment. In the field of mining, Bureau scientists are seeking a better understanding of rock and soil mechanics and trying to learn more about the action of explosives in breaking rock. The fundamental natures and structures of coal, petroleum, oil shale, and a wide variety of metals and nonmetals are being studied.

In each of these areas, the Department is laying a foundation of basic knowledge that is essential to assured advancement in all branches of mineral technology.

### *Resource Appraisal*

In the field of mineral resources, as in other areas of Departmental responsibility, the next century will witness growing competition for the nation's natural wealth.

The miner, the manufacturer, and the farmer of the future may each have a valid claim to the same limited quantity of some essential mineral resource or the land in which it occurs. When that time comes, Government can serve the people best by having at hand the information that will promote equitable and effective use of all resources.

Decisions as to whether public lands should be leased for mineral development or withheld for recreational use, or whether valuable mineral deposits should be inundated to provide irrigation water for farmlands, can be made only with full knowledge of the relevant facts and with an eye to the distant future.

For many years, the Department's Bureau of Mines has collected and correlated economic and technical data on production, distribution, consumption, and utilization of minerals and fuels in the United States and abroad. Such information, analyzed and evaluated by specialists, has provided a basis for intelligent planning of Bureau research and other activities. The results of these studies also have been disseminated to other Federal and State agencies, to industry, and to the public. This kind of information has consistently proved its usefulness in many areas of public and private interest.

To promote intelligent and effective utilization of mineral resources in the future, the Bureau is expanding and intensifying its fact-gathering program.

Studies of the methods employed and the costs involved in extracting, processing, and distributing minerals and fuels are being accelerated, and new emphasis is being placed on investigations that will reveal the true importance of minerals to different segments of the economy and the extent to which utilization of various resources depends upon development of others.

A comprehensive resource-appraisal program, designed to provide a definitive balance sheet for domestic mineral and energy supplies, also is under way. Although such a detailed inventory obviously can

*hroughout the mineral-bearing regions of the United States, teams of Depart-ental scientists operate in mobile geochemical laboratories to seek out new ineral resources for the future needs of America.*

ever be completed inasmuch as the resource picture keeps changing, running total is essential to those who must find the right decision n a tangle of conflicting interests.

Thus, by seeking new materials and additional sources of those we lready have, by minimizing waste, by rebuilding our fund of basic nowledge, and by acquiring the facts essential to effective and equiable use, the Department is preparing for the mineral-resource probems of tomorrow. The success of these major efforts will contribute ignificantly to the survival and growth of our society.

## *ead Time Required*

To keep pace with the nation's growth and economic progress, omorrow's mineral resource needs must be met by today's xploration.

Important mineral deposits must be found well in advance of actual eeds because of the time required to bring them into production. The easily discovered mineral deposits have nearly all been found and explored, thus increasing the difficulty and risk of finding new deposits to maintain an adequate level of domestic supply. A vigorous program of exploration is essential to meet the growing needs of the future in the face of these increasing difficulties.

Today's costs and risks are so great that private industry, in many instances, is reluctant to undertake the entire burden of the search for new domestic sources of minerals. Therefore, the Government shares this burden through the Department's Office of Minerals Exploration, which will pay one-half of the cost of the work authorized by exploration assistance contracts, with repayment from royalties on production.

The list of mineral commodities eligible for exploration assistance has now been expanded to 38 by the addition of gold, silver, iron ore, bismuth, sulphur, and tellurium. Other changes presently are being considered which will help industry in the search for new mineral reserves.

## *National Coal Resources and Prospects for the Future*

Studies undertaken by the Department's Geological Survey in 1961 revealed that coal constitutes 68 percent of the total ultimate recoverable reserves of mineral fuels in the United States. Petroleum and natural gas, the studies showed, total about 16 percent of the ultimate fossil fuel reserves, and oil from oil shale accounts for another 16 percent.

The estimated recoverable coal reserves of the nation totaled 830 billion tons as of January 1, 1960. Of this huge tonnage—some 1,442 times the recent annual production—47 percent is bituminous, 25.5 percent is sub-bituminous, 26 percent is lignite and 1.5 percent is anthracite and semi-anthracite. Even assuming a great increase in the rate of coal production, these reserves will last for many generations.

Despite these impressive figures, the problem of the use of coal as a fuel remains far from a solution.

## *Office of Coal Research Created*

To assist in the development of a stronger coal market in the immediate years ahead, and to insure optimum use of this vast resource, the Congress authorized the creation within the Department of the Office of Coal Research. Although this assignment is shared with the industry itself and with other agencies of Government and private business, the eventual success or failure of the Office of Coal esearch will be measured by its contribution to the development of panded coal markets.

Most of the increase in the use of coal in future years is expected come from the expansion of the industry's two largest growth arkets—steel and the electric utilities.

Today the Tennessee Valley Authority is one of the nation's best al customers. In fiscal year 1960, it used more than 18.6 million ns of coal for which it paid more than 82.5 million dollars.

But the coal industry knows from experience that even "assured" arkets—as the railroad and domestic consumers once were—can be st through lack of progress and research. Both steel and the electric ilities can and will use the energy fuel that results in the lowest enerated cost of electricity. Any appreciable change in the relative osts of coal, oil and gas would result in the gain or loss of millions f tons of market.

Thus, a vital function of the Office of Coal Research—which began s operations in the fiscal year just closed—is to aid in finding better nd cheaper ways of mining and preparing coal, delivering it to the onsumer at lower cost, and improving the efficiency and convenience f its utilization.

As contrasted with the longer-term and more-basic research program f the Bureau of Mines, the new Office of Coal Research is concen-rating its efforts on short-range projects aimed at providing the most mmediate assistance to the coal industry.

### A Milepost of the Year

During 1961, more than 100 contract proposals were received and eviewed by the Office of Coal Research. These proposals came from olleges and universities, coal industry research groups, corporate esearch organizations, mining and industrial companies, and in some ases from private individuals.

A milepost of the year was the signing of the first formal contract y the Secretary of the Interior. It calls for a comprehensive study o identify new products which would expand present coal markets nd generate new ones. Although the final report will not be available ntil early in 1962, sufficient information will be developed in 1961 o aid the Office in maximizing its impact and to indicate new areas f immediate promise.

### Oil and Gas Reserves

During the fiscal year, the American Petroleum Institute and the American Gas Association reported that estimated measured proved

*To meet the resource needs of the future, the Department promoted the conservation of oil and gas through scientific studies to insure efficient production and minimum waste.*

reserves of liquid hydrocarbons and natural gas in the United States reached new record highs in 1960, despite a reduction in reserves of crude oil.

The nation's crude reserves were estimated at 31.6 billion barrels at the end of 1960—down more than 100 million barrels from the end of 1959.

Natural gas liquids reserves were estimated at 6.8 billion barrels, an increase of nearly 300 million barrels from the preceding year.

Total reserves of liquid hydrocarbons—crude and natural gas liquids—were estimated at nearly 38.5 billion barrels, an increase of more than 187 million from the 1959 total.

Production of crude oil for the year was estimated at more than 2.4 billion barrels, down nearly 12 million barrels from the 1959 total. Output of natural gas liquids, however, totaled more than 430 million barrels, up more than 46 million from the preceding year, making total production of all liquid hydrocarbons total more than 2.9 billion barrels, an increase of more than 34 million barrels.

Production of natural gas in 1960 was estimated at more than 13 trillion cubic feet—an increase of nearly 650 billion from the previous year's total.

## *Looking to the Future*

From these figures it would seem abundantly clear that the production and reserve problems of the oil and gas industries remain some distance in the future.

Yet, following President Kennedy's reminder in his natural resources message to the Congress that the continental shelves bordering the United States contain roughly 20 percent of our remaining reserves of crude oil and natural gas, the Department acted during 1961 to accelerate leasing action on the Outer Continental Shelf off Louisiana and Texas—the first such action since early in 1960.

But of still broader importance was the approval by the Senate of a resolution authorizing the Senate Committee on Interior and Insular Affairs to make a full and complete investigation of the current and prospective fuel and energy resources of the United States, and of the present and probable future rates of consumption of these resources. The Committee, in addition, will examine Governmental policies and laws affecting the fuels and energy industries with the view of determining what, if any, changes may be advisable in order to provide an effective national fuels policy.

The objective of the study, which was given the strong support of the Department of the Interior, is to set forth policy guidelines which will assure the availability of energy for our expanding economy and the security of the United States.

There have been several attempts in the past 25 years to deal broadly with energy problems at the Federal level. However, the current study promises to be considerably more fruitful because it is the first full-scale examination of energy problems drawing upon the combined skills of the Congress, the Executive Branch, and the industries concerned.

## *Contribution From Indian Lands*

Since the beginning of the 20th century, Indian lands have contributed importantly in supplying the nation's mineral needs. On of the Department's aims is to facilitate their playing an equally or even more significant role in the future. The outlook, in broad terms, is distinctly encouraging.

Much of the oil and gas production from Indian lands has been in the Rocky Mountain region and the Williston Basin where exploratory work points to the strong possibility of broader producing areas On the Navajo Reservation, the number of applications that have been made for oil and gas leases foreshadows exploration of unproven areas and extension of proven fields. Oil production from this area already is of considerable importance. For example, the Greater Aneth field—probably the largest single field discovered in the last 10 years—is located almost entirely on the Navajo Reservation. Announced plans for secondary recovery of petroleum resources from Indian lands through waterflooding insure the production of millions of barrels of additional oil in the years to come.

The cutback in purchases of uranium by the Atomic Energy Commission has reduced exploration and production of this mineral in a number of Indian areas. Substantial evidence, however, now points to a growing "peaceful use" market for fissionable materials derived principally from uranium and much of this ore can be expected to come from Indian lands.

## *Minerals From Public Lands*

A great storehouse of mineral resources, is of course, within the lands of the public domain.

Administration and conservation of these vast mineral resources is the responsibility of the Department's Geological Survey and Bureau of Land Management.

The Geological Survey supervises all development and producing operations, and collects the royalties due the United States on such production. The Bureau of Land Management issues all permits, licenses, and leases for coal, oil, gas, and other fuels and minerals. Thus the two agencies share the responsibility for conservation of this valuable public resource.

During the fiscal year, programs were accelerated to assure, through surveys, inventories, use and replenishment studies, that the minerals storehouse of our public lands remains as fully stocked in the years to come as it is today

## *Commercial Fisheries—A Key to Future Food Needs*

President Kennedy has pointed out that, at present levels of use, this country alone will need an additional 3 billion pounds of fish and shellfish annually by 1980—and that many other countries with large-scale protein deficiency can be greatly helped by more extensive use of marine foodstuffs.

"This," the President said, "will require increased efforts, under Federal leadership, for rehabilitation of depleted stocks of salmon and sardines in the Pacific, groundfish and oysters in the Atlantic, lake rout and other desirable species in the Great Lakes, and many others hrough biological research, development of methods for passing fish over dams, and control of pollution. This Administration intends to give concerted attention to our whole national effort in the basic and applied research of oceanography."

Despite 90 years of effort by dedicated scientists, this announcement of plans for a comprehensive Federal oceanographic program represented the most important advance yet made toward the goal of "farming" the sea.

Through this program, now getting under way, will come the information needed for the harnessing and building of the forces which affect the living resources of the sea and disclose the ways of adapting them to the needs of man.

## *The Food Chain of the Sea*

The food chain of the sea gets its start from two sources—nutrients from land brought into estaurine areas and tidal flats, and nutrients brought up from the depths of the ocean by natural upwellings, or vertical currents.

These upwellings occur usually in two types of situations. They are found on the west side of continents because the winds from the land tend to push the water away from the shore, giving the lower strata of water a chance to rise. They are also found along the Equator where the trade winds and the rotation of the earth combine to roll the surface waters north and south, leaving a trough which is filled with water from the lower levels. At times upwellings may be found along the edges of some ocean currents where the meeting of cold and warm waters result in an upflow. The nutrients so brought to the surface waters form the basis for the flood chain which supports the sea life in which man is most interested.

An ultimate accomplishment for the farming of the sea will be the creation of artificial upwellings to provide food for marine life when and where needed. The practical-minded fishery scientist does not

*The sea around us represents another bountiful resource which helps to meet the ever-increasing food needs of the Nation—both today and in the future.*

expect these results to be quickly arrived at, but he refuses to rule them out as a probability of the future resulting from increased scientific knowledge together with the pressures of population growth.

While awaiting the time when atomic or other energy can be applied to create artificial upwellings, man must content himself with other ways of utilizing the components which support the food chain. The seas are too vast and the waters too restless for the application of fertilizers as they are applied to land, but the use of trace elements hich will energize and stimulate the growth possibilities already resent is an avenue being considered.

## *mproved Research and Management*

At the same time the Department's Fish and Wildlife Service is iving increased attention to that part of aquaculture which has the est chance of success in the next few years. This includes perfecting esearch and management techniques to assure that stocks of desirable pecies will not be depleted and replaced by less desirable or inferior pecies. It also includes the culture of certain kinds of shellfish, articularly clams and oysters. Since this type of marine life is ore sedentary than many other forms it lends itself more readily to arming practices.

Culture of shellfish is not new, but this form of sea farming has een handicapped by such things as blight, predators, and lack of seed tock. These problems have been under scrutiny, and answers are lowly but surely being found. At the same time, research on selective reeding goes on.

## *Salmon Research Program*

An important development during the year was the granting of pproval by the Congress for an emergency Alaska salmon research program. This 2-year program, for which a total appropriation of $2.5 million was authorized, is now well under way.

Information gained from the investigations will supplement that already acquired through research conducted by the United States and investigations made under terms of the International Convention for the High Seas Fisheries of the North Pacific Ocean. This Convention, between Japan, Canada, and the United States, became effective in 1953, and its continuation, termination, or amendment is scheduled to be decided upon at a meeting of the signatory nations in 1963.

Specific data sought through the emergency program relate to the carrying capacity of the Alaska spawning streams and methods of predicting salmon abundance. The Alaska Department of Fish and Game and the Fisheries Research Institute of the University of Washington are aiding in the research under contracts with the Department's Bureau of Commercial Fisheries.

In another move involving international cooperation in conservation and development of fishery resources, the United States Government, acting upon the recommendation of the Department, has invited the Food and Agriculture Organization (FAO) to hold its world meeting on the biology of tuna and tuna-like fishes in July 1962, in the San Diego area of California.

The fundamental objective of the conference is to assess the potential of the world's tuna stocks. The tunas, which were discarded fishes a half century ago, are now fished in every ocean except the Arctic and the Antartic and by fishermen of many nations. It is hoped that from the conference will come a composite picture of the rate of utilization and the possibilities and limits of future development.

### *Meeting the Challenge*

At the 1961 FAO International Conference on Fish in Nutrition—held in Washington—man was challenged to "plow" the seven seas and make them yield protein in twice the amount of that provided by land.

The Department of the Interior is moving to meet that challenge through such programs as these:

—A study of the nation's estuarine areas to determine if the encroachments of civilization are destroying fishery resources which utilize estuaries and tidal flats at some stage in their life history, or whether these developments can be turned into assets for marine life.

—Biological studies designed to guide man in the manner and times in which sea harvest can be taken most economically and the extent of the harvest to assure sustained yield of the resource.

—A research program designed to assure full utilization of the health and nutritional values of fishery products.

"The sea around us," President Kennedy has said, "represents one of our most important but least understood and most wholly undeveloped areas for extending our resource base."

During 1961, the Department of the Interior made important contributions toward better understanding and greater development of our great marine food resource.

## *Building for Tomorrow in the Territories*

Lying some 1,000 miles south of the Equator, American Samoa is a land of spectacular tropical beauty. The islands boast one of the finest harbors in the Pacific, and because of this they represented an important staging area for part of the American war effort in the South Pacific.

Yet, in the intervening years, the needs of these beautiful islands and its people have been largely forgotten or ignored.

The situation in regard to education of American Samoa's young

*onstruction of buildings to house South Pacific Commission Conference delegates howed this progress at the end of the fiscal year. Both buildings are scheduled o be reconverted after the conference for high school expansion.*

eople is a typical example. Today, on the islands, there are 45 public lementary schools, but the existing public junior and senior high chools provide nowhere near the space or facilities to meet the needs f elementary school graduates. Enrollment in the lone high school s currently limited to approximately 200 as contrasted to some 4,000 hildren enrolled in elementary schools.

"We are having to turn down at least two-thirds of the students that graduate from junior high," Governor H. Rex Lee told the first session of the 87th Congress during hearings on appropriations for this fiscal year.

The situation has been much the same in other areas. The existing power system, for instance, is subject to frequent failures and is unable to meet the current demand for power, to say nothing of the future.

This Department has moved rapidly to bring about important changes and improvements for these "forgotten" people.

Congress granted appropriations to expand the high school plant and to rebuild the power system. At the close of the fiscal year, the new high school buildings were nearing completion, and a contract had been let to provide new power generating units.

Congressional approval was also granted for a supplemental appropriation of $1.5 million to permit a sharp acceleration of the Department's programs to provide urgently needed services and facilities in the territory.

## *School Space for Every Child*

Further educational construction ranks high among the items included in the supplemental appropriation act. When expended, these funds are expected to provide space in school for every child in American Samoa.

Other construction included in the supplemental appropriation are road improvements, repairs to government facilities, such as docks, improvements to the water system and other utilities, and reconstruction of certain medical facilities.

At the same time, a vigorous program is underway to develop a productive and self-sustaining tourist industry based not only on the islands' scenic beauty, but also on expansion and development of recreational resources. Tourism, as well as other economic progress, is expected to be enhanced by completion next year of a modern jet airport, on which construction was accelerated in 1961. Improvement

*Ancient customs and ceremonies on American Samoa are retained by the population while moving toward more democratic forms of local government.*

and diversification of agriculture has also been started and a deep-sea ishery training program for Samoans is showing encouraging results.

Meanwhile, economic development by private capital is not being overlooked. Negotiations are underway for the construction of a hotel to accommodate the tourist industry, and plans are being developed for possible location of a coconut processing plant in the territory. The provision of adequate public utilities and services is expected to lead to further use of Samoa's economic resources.

The sharply increased appropriation requests of this Administration have been designed to bring lagging economic and social development up to the levels reached to date in the political field.

An important milestone in political development was the election of the lower house of the Legislature by secret ballot, followed in 1960 by the drafting of a Constitution defining the powers of the territorial government and giving the Legislature certain legislative powers in place of its previous advisory functions.

### *Matched in Other Areas*

This effort toward new progress in American Samoa is being matched in the other farflung areas for which the Department has responsibility in the Kennedy Adminstration's determined efforts to raise and expand resource horizons wherever and whenever possible.

In addition to Samoa, the Department's responsibilities extend from the Virgin Islands in the Caribbean to Guam and the Trust Territory of the Pacific Islands in the western Pacific.

Actually, the most important resource in these areas is the people themselves, a total of some 196,000 persons living on specks of land aggregating little more than 1,100 square miles. The task of economic and political development is infinitely varied, with peoples living in a thoroughly American society in Guam and the Virgin Islands at one end of the spectrum and with some peoples on remote islands of the Trust Territory still living much as they did in the middle of the last century.

But, regardless of location or current standard of living, the future depends upon today's and tomorrow's use and development of the resources of each territory, however presently limited. In each offshore area revitalized resource programs of agricultural improvement and economic diversification have been inaugurated or are being planned for the months ahead.

## *Progress in the Virgin Islands*

In the Virgin Islands, as in other territorial areas, no minerals have been found in commercial quantities. The economic backbone of the islands is the tourist industry and related recreational facilities. An accelerated program in underway to expand and develop the tourist economy on a year-round basis. A serious shortage of potable water and electric power, which has plagued the islands for many years, will be alleviated early in the calendar year 1962 with the completion of a water distillation plant with its electric power by-product. A stepped up agricultural program has been inaugurated and farmers are being encouraged to raise more foodstuffs in order that the islands may be more self-sustaining. Meanwhile, a reorganized Virgin Islands Department of Commerce is working toward diversification of the business and industrial life of the islands.

Since World War II, Guam has depended on a single industry—defense and defense-related activities. Recognizing the necessity to broaden the base of the island's economy, the Department is working rapidly toward development of an export trade program, industrial expansion, and an agricultural and fishery resource program. At the same time, the homesteading of government lands for the development of privately-owned farms is being encouraged.

The Trust Territory of the Pacific, with its more than 2,000 widely scattered islands and its greatly varied cultural groups, presents challenging problems in resource conservation and development. The people of the Territory are being encouraged to vitalize the economy by the expansion of both subsistence and export agriculture; the development of new marketable products to lessen the dependence upon copra (the single major export product); the development of commercial fishing; and the establishment of boatbuilding enterprises for fishing and transport.

## *Gaining Momentum*

While spectacular progress in these widely scattered islands cannot be expected, it can be seen from the developments outlined here that the Territories have by no means been overlooked or neglected in the press toward full resource use and conservation. Many and varied programs are underway, and momentum is rapidly being gained.

In comparison to the vast comparable resource programs being undertaken in the continental United States, these actions may seem minute. But to the people of the islands they are far more than that—they represent tomorrow's hope.

## *Part* II

# ANNUAL REPORTS OF THE BUREAUS AND OFFICES OF THE DEPARTMENT OF THE INTERIOR

# Office of the Assistant Secretary

## *Water and Power Development*

KENNETH HOLUM, *Assistant Secretary*

THE ASSISTANT SECRETARY for Water and Power Development acts for the Secretary in implementing this area of the Department's program. He exercises secretarial supervision and direction over the Office of Saline Water, Bureau of Reclamation, Bonneville Power Administration, Southeastern Power Administration, and Southwestern Power Administration.

Largest and oldest of these agencies is the Bureau of Reclamation. It constructs water-use projects primarily for the reclamation of arid and semiarid lands in the West. It also markets electric power from projects built by itself and the Corps of Engineers in the 17 western States, exclusive of the Bonneville Power Administration's area, and operates high voltage transmission systems.

Bonneville Power Administration, Southeastern Power Administration and Southwestern Power Administration are strictly power marketing agencies. Along with the Bureau of Reclamation they market all electric power generated from federally-built water resource development projects and facilities.

Bonneville's market area, in which it also operates an extensive high-voltage transmission system, is a four-State area of the Pacific Northwest. Southeastern sells power in southeast States and Southwestern Power Administration in the central southwest States. The latter also operates a high-voltage transmission system.

On February 23, 1961, President John F. Kennedy issued the following set of principles governing the marketing of federally-produced power, under laws established by Congress:

1. Preference in power sales shall be given public agencies and cooperatives.
2. Domestic and rural consumers shall have priority over other consumers in the disposal of power.
3. Power shall be sold at the lowest possible rates consistent with sound business principles.
4. Power disposal shall be such as to encourage widespread use to prevent monopolization.

Pertinent data covering hydroelectirc power marketing by the Department of Interior agencies in fiscal year 1961 are summarized in the following table:

*Power production and marketing data, fiscal year ended June 30, 1961*

| Marketing agency | Installed capacity, as of June 30, 1961 (kilowatts) | Net energy generated (million kilowatt-hours) | Energy marketed (million kilowatt-hours) | Gross revenue (thousands of dollars) | Percent of power marketed to preference customers |
|---|---|---|---|---|---|
| Bureau of Reclamation | [1] 6,216,085 | 27,851 | [4] 14,798 | [5] 55,917 | [6] 85.4 |
| Bonneville Power Administration | [2] [3] 3,937,000 | 17,424 | 28,522 | 69,702 | 38.7 |
| Southwestern Power Administration | [2] 601,000 | 1,912 | 2,196 | 14,877 | 71.3 |
| Southeastern Power Administration | [2] 1,283,600 | 3,855 | 3,862 | 19,711 | [7] 33.5 |
| Total | 12,037,685 | 51,042 | 49,378 | 160,207 | |

[1] Includes 985,035 kilowatts in Corps of Engineers, 31,500 kilowatts in International Boundary Water Commission, and 5,199,550 kilowatts in Bureau of Reclamation projects.

[2] Capacity in Corps of Engineers projects.

[3] Bonneville Power Administration also markets power from Bureau of Reclamation's Grand Coulee, Hungry Horse, Chandler and Roza powerplants with a capacity of 2,252,250 kilowatts.

[4] Excludes 12,677 million kilowatt-hours delivered at Grand Coulee, Hungry Horse, Chandler, and Roza powerplants by Bureau of Reclamation to Bonneville Power Administration (this amount include in Bonneville Power Administration "energy marketed").

[5] Excludes $16,978,000 revenue received by Bureau of Reclamation from Bonneville Power Administration (this amount included in Bonneville Power Administration "gross revenues").

[6] Excludes 12,677 million kilowatt-hours delivered to Bonneville Power Administration.

[7] In addition, 57.3 percent of the total energy was marketed to the Tennessee Valley Authority.

The Office of Saline Water conducts programs to develop low-cost methods of converting saltwater from both the sea and ground to fresh water. It builds and operates plants to test various processes. The first of five authorized plants was completed and put into operation at Freeport, Tex., during fiscal 1961 and ground was broken for a second plant at Webster, S.Dak.

Certain defense functions dealing with electric power have been delegated to the Secretary by the Office of Civil and Defense Mobilization. These responsibilities are discharged by the Assistant Secretary through direction of the Defense Electric Power Administration. Under this program a field organization stands ready to handle specific postattack power problems. It is made up of 16 power areas, each headed by a director with a deputy and an alternate. Power liaison personnel have been appointed to each of the eight OCDM regional offices, designated for each state and most of the local civil defense offices throughout the Nation.

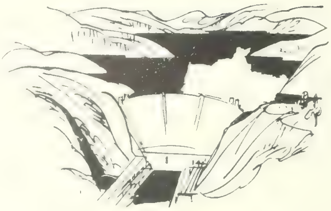
The Assistant Secretary conducted numerous conferences in Washington and in the field on power marketing problems and irrigation matters, with water and power consumer groups, congressional delegations and representatives of industry and local interests. He testified before congressional committees and appeared before interagency groups.

Of particular significance was the appointment of a five-man departmental task force to study the proposed Pacific Northwest-Pacific Southwest extra high voltage transmission intertie. The supplemental power supply program in the Missouri River Basin was extended through the navigation season 1965.

During the year the Office of Assistant Secretary reviewed 44 reports of the Corps of Engineers, Department of the Army, primarily for flood control and navigation improvements; 43 Federal Power Commission applications for permits and licenses to build hydroelectric projects; and 59 Department of Agriculture watershed work plans.

# *Bureau of Reclamation*

Floyd E. Dominy, *Commissioner*



START OF CONSTRUCTION on seven new dams in the West highlighted a year of achievement in water resource planning and development by the Department of the Interior's Bureau of Reclamation during fiscal year 1961.

The new construction starts were initiated in five States—Whiskeytown Dam and Lewiston Dam in the Central Valley Project of California; Fontenelle Dam in the Seedskadee Project of Wyoming; Crawford Dam in the Smith Fork Project and Lemon Dam in the Florida Project in Colorado; Yellowtail and Merritt Dams in the Missouri River Basin in Montana and Nebraska.

Under its planning and construction program for the fiscal year 1961, the Bureau of Reclamation continued to develop water and land resources in the 17 contiguous Western States, Alaska, and Hawaii.

An investment of about $230 million was added to the Bureau's $3.5 billion investment in western projects through completion of dams, powerplants, irrigation canals, pumping plants, electrical transmission lines, and other wealth-creating facilities of benefit to the entire nation. Construction completed during the year added more than 682,000 acre-feet of storage capacity in new Reclamation project reservoirs, 48,000 kilowatts of hydroelectric generating capacity, 462 miles of canals and related water conveyances and distribution structures, and 558 miles of high-voltage backbone transmission lines. These are listed in table 2 of the appendix.

Operation and maintenance of irrigation facilities during the year related to 196 storage or regulating reservoirs, 120 diversion dams, and carriage, pumping, and distribution facilities of irrigation water to almost 8.2 million acres of fertile farm land, comprising 128,224 farms on which 525,000 persons resided.

## *Billion-Dollar Harvest*

The harvest of crops on irrigated farms in Reclamation projects during the 1960 crop year exceeded $1 billion for the second successive year. The crops grossing a record total return of $1,157,528,693 were harvested from 6,899,711 acres in the 17 contiguous Western States, making an average return per acre of $167.76, also a new record. Only a negligible portion of this production was in crops in surplus supply. Details of this production are shown in tables 7 and 8.

The 177 recreation areas on Reclamation projects received 24.3 million visitor days of use in 1960. These multipurpose water recreation attractions included 7,000 miles of reservoir shoreline and 1.4 million acres of water surface area.

Municipal and industrial water usage increased 37 percent over the 1959 usage, to reach a total consumption of 397 billion gallons. This water is marketed by 90 contracting entities which provide water to more than 200 communities and major industrial users. The cities and towns served contained 8,778,150 persons.

Reclamation project towns and cities continued to absorb project lands in their growth. In 1960 the acreage thus urbanized reached 181,543 acres, up 13,436 acres since 1959.

During the fiscal year, Bureau project planning technicians were engaged in the investigation and planning of proposed projects and units of projects throughout the West. Surveys for comprehensive water resource development were underway in ten river basins in the West, including one subbasin of the Missouri River Basin.

## *Evaporation Reduction Tests*

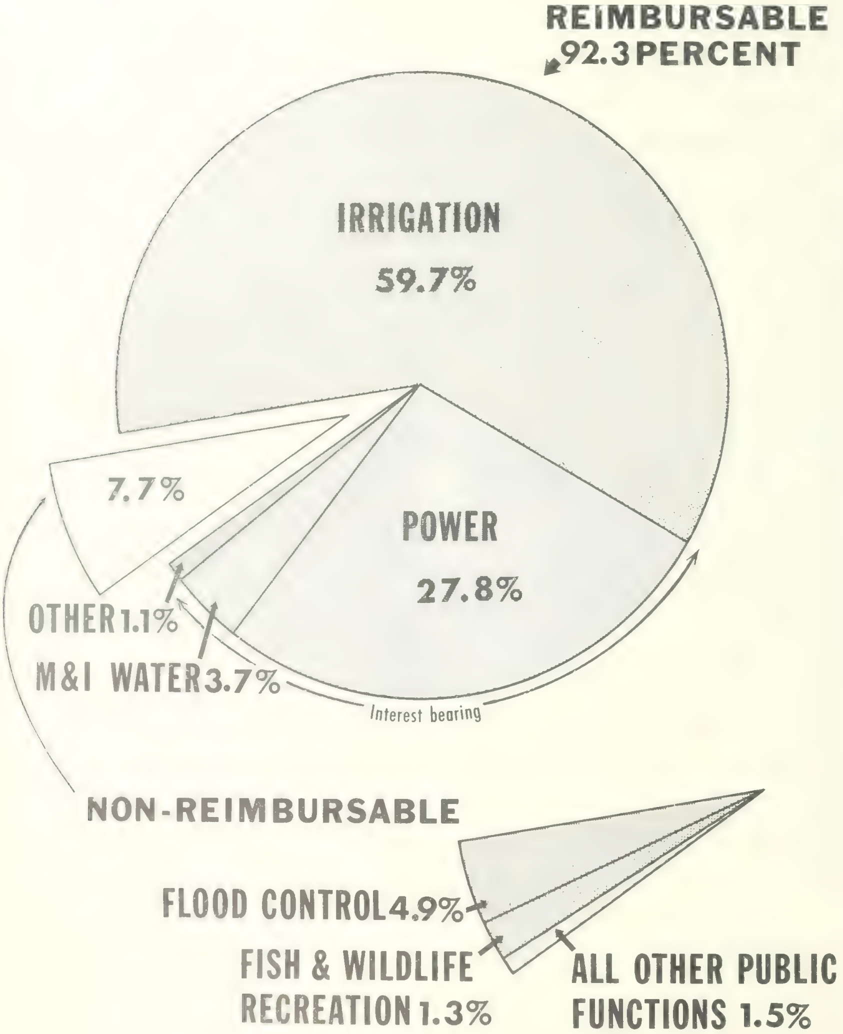
A highlight of the extensive Bureau research program was the performance, in cooperation with other agencies, of full-scale evaporation reduction tests at Sahuaro Lake near Phoenix, Ariz., and the preliminary work for mid-1961 tests at Cachuma Reservoir, Calif.

The Bureau marketed hydroelectric power produced at 47 Federal powerplants, which had a gross revenue during fiscal 1961 of $72,743,347. The Bureau itself operates 42 powerplants with an installed capacity of 5,199,550 kilowatts.

During the fiscal year, the total value of all contracts awarded amounted to nearly $171 million, comprising more than 700 separate

**ALLOCATION OF PROGRAMMED COSTS**

(ULTIMATE $8.0 BILLION)



contracts for construction, materials, equipment, and supplies. Of this, construction contracts accounted for about $137 million, or 80 percent. As shown in table 1 in the appendix, 36 major construction and supply contracts exceeding $1 million were awarded during the fiscal year.

Approximately 255 construction contracts having a value of more than $77 million were completed during the year. There were 200 construction contracts in force at the end of the year with a total value of about $438 million.

To assist in the overall government effort, ordered by President Kennedy to improve economic conditions in depressed areas, an accelerated work program was initiated in February 1961 to speed up the preparation of designs and specifications for impending contracts for construction and equipment. This acceleration was aimed at awarding all contracts possible before June 30, 1961, and affected a large number of construction and operating projects throughout the West. Procurement contracts for supplies and equipment were moved up as much as 2 years due to the expedited operations initiated to improve the national economy. Several important supply contracts were negotiated with manufacturers in areas of heavy unemployment under a set-aside procedure established in accordance with the President's program of aiding such areas.

A total of 123 construction specifications, 141 major supply invitations, and 199 minor procurement invitations were issued in fiscal year 1961. This was 32 more construction specifications, 83 more major supply invitations, and 112 more minor procurement invitations than during the previous year. This increased accomplishment was mainly due to the accelerated design and procurement program and represented a greater record than that accomplished during recent years.

### *Small Business Aided*

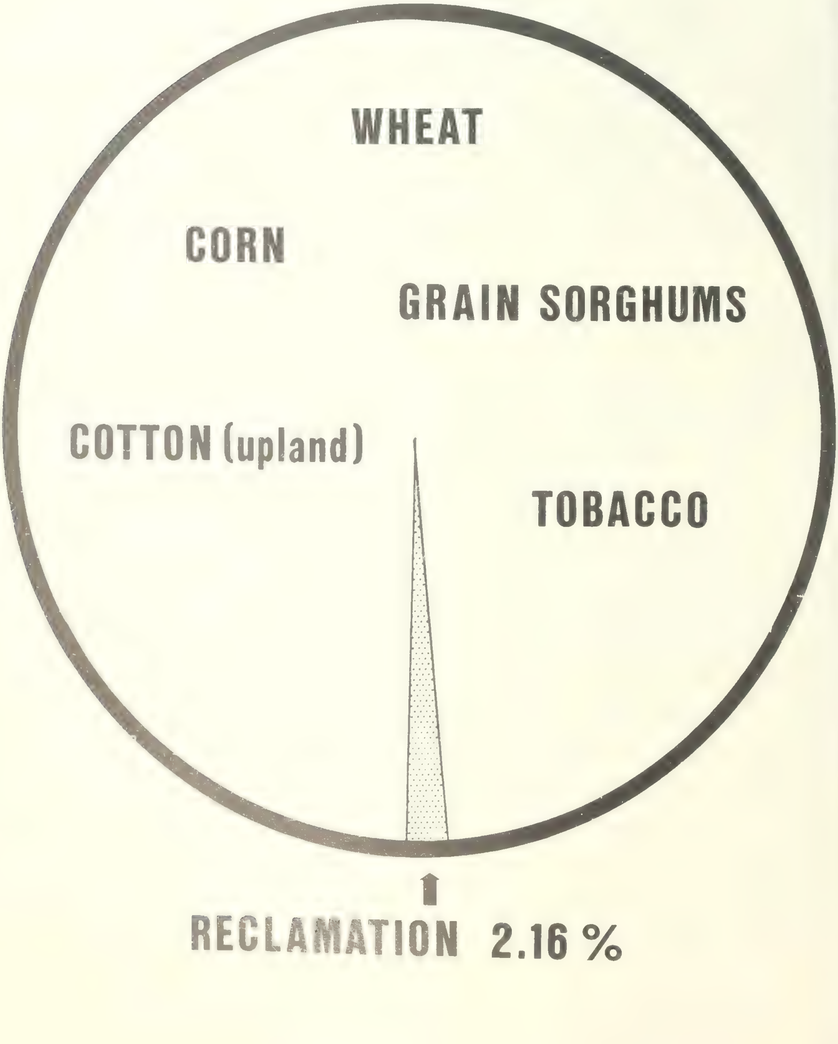
There were 75 invitations (45 major supply, 30 minor procurement) set aside for bidding only by small business firms during the fiscal year. This number of set-asides was greater than at any time since the program was begun. By comparison, only 18 invitations were set aside during the 1960 and 48 during the 1959 fiscal years.

The handling of bids for materials involving identical bids was a subject of national interest during the year, and the Bureau compiled and submitted a large quantity of information to the Antitrust Division, Department of Justice, in connection with 20 grand jury indictments of firms manufacturing various electrical items. Reports are being furnished for submittal to the Justice Department, on a continuing basis, for types of equipment involved in the 20 indictments. Also on a continuing basis, photostat copies are made of original contract documents involving the electrical equipment items covered by the indictments.

Two Bureau project offices established in other nations, by invitation, to assist in water resource development were expanded during

# CROP SURPLUS NOT AFFECTED BY RECLAMATION

## 5 CROPS COMPRISE 94.83 PERCENT OF CCC LOANS AND INVENTORIES



*Glen Canyon Dam in Arizona, major Colorado River storage project unit, climbs toward its designed height of 710 feet.*

the year. The projects, staffed with Bureau technical personnel in cooperation with the International Cooperation Administration, are located in the Helmand Valley in Afghanistan and in the Blue Nile River Basin in Ethiopia. In addition, the Bureau dispatched 18 of its own specialists to 13 foreign countries for short-term assistance details, and provided in-service training for 356 visiting students, technicians and water resource officials from 34 countries.

Further details of the varied program of the Bureau of Reclamation are provided in the following sectional report on fiscal 1961 activities.

*The "Statistical Appendix to the Annual Report of the Commissioner" contains complete annual and cumulative data on the Bureau's* *irrigation, municipal water and power accomplishments, measured i both dollars and physical units, together with related investigation construction, operation and administration information.*

## *Construction Highlights*

On the East Unit, Greater Wenatchee division, of the Chief Joseph Dam project in Washington, construction which started in Januar 1961 on a river pumping plant, booster pumping plant, and a 2-million gallon reservoir to raise 76 cubic feet per second of water from th Columbia River was about 20 percent complete. In the Columbi Basin construction of the Royal Branch Canal laterals in Block 8 was completed in July 1960, except for pumping units which were returned to the factory for retesting and correction. These were reinstalled in April 1961. The West Canal Lateral System in Block 8 was completed in June 1961. Construction of the Hope Valley and Frenchman Hills pumping plants for the West Canal Lateral System in Block 80 was about 90 percent complete at the end of the fiscal year. The lateral system in Block 80 of the West Canal Laterals was also about 90 percent complete.

In Oregon, the earthfill Prineville Dam, Crooked River project, was completed except for installation of the elevator in the outlet works gate shaft. Construction of the Crooked River Diversion Canal and headworks was essentially completed at the year's end. Construction of the Ochoco Relift and Barnes Butte pumping plants, started in August 1960, was about 90 percent completed. The first section of the distribution canal was constructed during the year.

Enlargement of Emigrant Dam, Rogue River basin project, Oreg., was completed in April 1961. The South Fork, Daley Creek, and Grizzly Creek collection canal system and diversion dams were completed. Other construction completed included major structures for the East Lateral rehabilitation and new structures for the Ashland Lateral rehabilitation. The fish screen structure for Hyatt Prairie Dam and rehabilitation of the Oak Street Diversion Dam and first section of Talent Lateral were also completed. Rehabilitation of the second section of the Talent Lateral was nearly completed at the end of the fiscal year in less than half of the contract time.

In Montana, installation of acoustical treatment to reduce the noise level in the turbine gallery of the Hungry Horse powerplant was accomplished in May 1961.

## *Pacific Coast and Nevada*

In the American River division of the Central Valley project of California, the El Dorado Main Lateral System, started in February 1961, was about 15 percent complete at the end of June, in 30 percent of the contract time. In Central Valley's Friant division, construction of the Tea Pot Dome Water District Lateral 99.4 and sublaterals was completed. Construction of the Stone Corral Irrigation District Lateral System, started in April 1961, was about 20 percent complete at the end of June. Construction of part 1 extension of the Madera Distribution System, started in February, was about 40 percent complete. Construction of the Corning Canal pumping plant in the Sacramento River division was completed.

On the Trinity River division the 10.7-mile-long Clear Creek tunnel was holed through at the end of July 1960. Placing of concrete lining in the invert of the tunnel was completed and placement of arch lining was started. At the end of June 1961, work was about 96 percent complete in 90 percent of the contract time. Construction of Trinity Dam was essentially completed in October 1960, except for the outlets works and the penstock installation. The outlet works stilling basin was completed in May, the control valves installed, and the anchor block and foundation for the control house completed. The dam was 97 percent complete in 85 percent of the contract time at the end of the fiscal year. Construction of the Trinity powerplant building (prime contract) which was started in August 1960, was about 80 percent complete at the year's end in 60 percent of the contract time. Clearing of two areas of the Trinity Reservoir was completed and the third area was about 90 percent complete at the fiscal year end.

Tunnel No. 2 of the Spring Creek Power Conduit was holed through in June 1961. Excavation of tunnel No. 1 was about 60 percent complete. The surge tank excavation was about 75 percent complete. Construction of the Spring Creek powerplant (prime contract) was started in 1960 and was about 36 percent complete at the end of June, slightly ahead of schedule. The tailrace tunnel was holed through in April.

Construction of the Clear Creek powerplant was started in August 1960. By the end of June the work was about 50 percent complete in 40 percent of contract time.

Construction of Whiskeytown Dam was started in September 1960 and had reached 30 percent completion by the end of June.

At Lewiston Dam, the Trinity River was diverted through an old existing placer mine diversion tunnel in March 1961 to get this job off to a fast start. The foundation was excavated and foundation grouting well advanced and placement of embankment startec The fish hatchery outlet works and river outlet works were completed. The entire job was about 18 percent complete in 22 percen of contract time at the end of June.

On the Klamath project, Oregon and California, six contract for pumping plants, lateral systems, and drains were in progres during the year in the sump No. 2 and 3 areas of the Tule Lak division. All except two were completed by the end of June.

In Nevada, construction of Prosser Creek Dam in the Washoe project was shut down for the winter from early November until mid April. At the end of June 1961, work was about 43 percent complet in 61 percent of the contract time. Concrete for the diversion stag of the outlet works was completed in May and foundation grouting essentially completed in June.

### *Bonneville Basin*

On the Weber Basin project, Utah, construction of the second stage embankment for Willard Dam was continued, except for winter shutdown, and by the end of June 1961 was nearly 80 percent complete. Pipeline and reservoir construction for the North Davis laterals, unit 1, of the Davis Aqueduct lateral system was started in September and was about 97 percent complete at the end of June. Pipeline and structures for the West Farmington lateral system were started in January and were nearly complete at the end of the fiscal year.

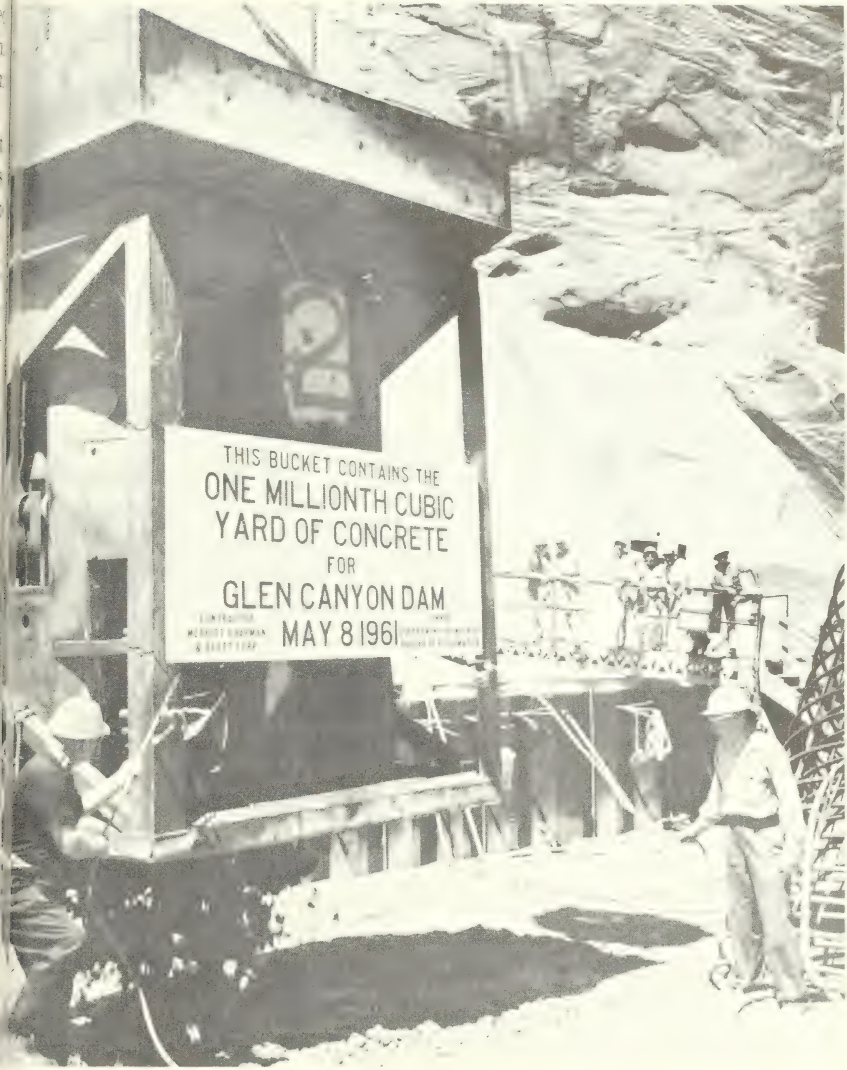
Work on the Provo River project, Utah, was mainly concerned with construction of dikes and revision of the Provo River channel, with one project completed in June and three others continuing until later in the year.

### *Colorado River Basin*

At the Hoover powerplant, Boulder Canyon project, field erection was about 80 percent complete for the 17th and final generator and about 65 percent complete for the turbine and electrical work at the end of June.

On the Colorado River front work and levee system project, construction of Gila River Pilot Channel from the Gila River siphon to the Colorado River was started in October 1960, and completed the following February. Construction of the companion main outlet drain was started in January and by the end of June was about 75 percent complete, well ahead of schedule.

Construction of the Steinaker Dam, Central Utah project, a participating project of the Colorado River storage project, was completed



*Engineers pull lanyard releasing 1-millionth cubic yard of concrete into Glen Canyon Dam.*

in December 1960. The Fort Thornburgh Diversion Dam, Steinaker Feeder Canal, and Rock Point Canal extension were started in July 1960, and completed in May 1961. Construction of the Steinaker Service Canal, started in April 1961, was about 20 percent complete by the end of June.

In Wyoming construction of Government camp facilities for Fontenelle Dam of the Seedskadee project was started in May 1961.

The $7,017,000 contract for construction of Fontenelle Dam was awarded in June 1961.

Approximately 165,000 cubic yards of concrete were in place at the Flaming Gorge Dam, Colorado River storage project, in northeastern Utah. Excavation of the spillway tunnel was completed in May. The entire contract was about 47 percent complete at the end of the fiscal year in 60 percent of the contract time. Work started at the Vernal end of the Flaming Gorge-Vernal section of the 85-mile-long Flaming Gorge-Vernal-Rangely 138-kv transmission line. Work wil proceed on the 119-mile-long Rangely-Oak Creek 115-kv transmission line as soon as the contractor procures materials.

The 1-millionth cubic yard of concrete was placed in Glen Canyon Dam, in northern Arizona, early in May 1961. By the end of June a total of 1,250,000 cubic yards had been placed. Concrete lining had been placed in all but the upper 100 feet of the left spillway tunnel raise and preparations were made for starting lining of the right spillway tunnel raise. Concrete placing was essentially completed to the base of the superstructure for Unit Bay 1 of the powerplant and superstructure structural steel has been erected. The other seven unit bays, service bay and machine shop were in various stages approaching that of Unit Bay 1. The entire contract was about 53 percent complete at the end of June 1961 in 62 percent of the contract time. The construction of the temporary tourist shelter on the left abutment was completed in June 1961.

Construction of Navajo Dam, on the San Juan River in New Mexico, was about 84 percent complete at the end of June in 63 percent of the contract time. The 20-millionth cubic yard of embankment now in place represents about 75 percent of the total required. The outlet works and auxiliary outlet works are complete except for second stage concrete. The spillway is complete except for the crest structure and inlet. A contract for relocation of the D&RGW Railroad and county roads in the reservoir area was started in November 1960 and was nearly completed at the end of June 1961 in less than half the allotted time.

Construction of the first section of the main canal in the Hammond project, participating project of the Colorado River storage project, in New Mexico, was started in August 1960 and was completed in June 1961. Construction of the Hammond Diversion Dam was started in April 1961 and was about 15 percent complete at the end of the fiscal year. Construction of the Hammond pumping plant was started in June.

The embankment for Paonia Dam in the Paonia project of Colorado was nearly completed at the end of the fiscal year. The entire work was about 98 percent complete in 90 percent of contract time. The reservoir area clearing was completed in December 1960.

On the Smith Fork project in Colorado, construction of Crawford Dam was started in October 1960, and work at the end of June was mainly concerned with drilling the outlet works tunnel and placing the concrete lining preparatory to diversion. The work was about 35 percent complete at the end of the fiscal year and just about on schedule.

On the Collbran project of western Colorado the first and second sections of the Southside Canal were completed. The Leon Creek and Park Creek Diversion Dams and Leon Creek Feeder Canal were also completed. Work on the Bonham and Cottonwood pipelines was far behind schedule, which could cause serious delays in operation of the Molina powerplants. At the end of June the work was less than 70 percent complete in 90 percent of the contract time.

The contractor was instructed to increase his work force and requirements to insure completion in accordance with the contract. Construction of the Upper Molina and Lower Molina powerplants and penstocks was over 90 percent complete in 96 percent of the contract ime. The powerplant structures are virtually complete and installaion of equipment was in progress. The penstock for the Lower plant was essentially completed in May and a large part of the Upper plant penstock was also completed.

## *Southwest Projects*

On the Middle Rio Grande project, N. Mex., channelization of three reaches of the Rio Grande was in progress. One of these was completed in September 1960, the second was nearly complete at the end of June 1961. The third was in process of clearing right-of-way and stockpiling jetty materials. Rehabilitation of older irrigation units in the Belen, Albuquerque and Socorro areas was in progress on seven jobs all of which were completed in the nonirrigation season between October 1960 and March 1961.

Work on Twin Buttes Dam, the San Angelo project, Tex., reached about 55 percent completion in 38 percent of contract time at the end of June 1961. Nearly 11½ million cubic yards of embankment had been placed of the 21 million cubic yards required. Clearing of the Twin Buttes Reservoir is underway and about 20 percent complete, the railroad relocation completed, and a contract was awarded for the 16-mile main canal.

In the Fort Cobb division of the Washita Basin project, Okla., construction of a district office building was completed in March.

*Men work on concrete face of Flaming Gorge Dam on Green River in Utah as structure rises toward its ultimate height of 502 feet.*

Construction of remote control and telemetering facilities for the Anadarko Aqueduct was about half completed at the end of the fiscal year.

In the Foss division, construction of Foss Dam was completed in March 1961. Construction of the 50-mile Foss aqueduct, including Clinton, Bessie, and Cordell laterals under a contract awarded in 960, was about 30 percent complete in 42 percent of the contract time at the fiscal year end. Clearing of the Foss Reservoir was completed n April. Construction of Foss pumping plants Nos. 1, 2, and 3 was tarted in November 1960 and, by the end of June, was about 25 percent complete. Construction of the Foss district office building was tarted in November 1960 and completed in March 1961.

### *Missouri River Basin*

In the Bighorn Basin division, Missouri River project, Wyo., Anchor Dam on the Owl Creek Unit was completed in October 1960, and grouting of the contraction joints was completed in May 1961. Remedial action is being studied on water escapement in the reservoir area.

In the Lower Bighorn division, the first work in connection with Yellowtail Dam, Mont., was started in November 1960. The prime contract for construction of the dam was awarded in April 1961. By the end of June, the contractor had moved in a large amount of equipment, and camp and construction facilities and work roads were being constructed.

In the Three Forks division, Missouri River Basin project, relocation of 15 miles of Union Pacific Railroad for the future Clark Canyon Dam and reservoir, in the East Bench Unit, was started, and, by the end of June, was about 60 percent completed in 40 percent of the contract time.

In the Transmission division, Missouri River Basin project, the Fort Peck-Dawson County leg of the 310-mile-long Fort Peck-Dawson County-Bismarck 230-kv transmission line had been completed in June 1961; the remaining Dawson County-Bismarck section was completed in October 1960. Foundations and towers for the 100-mile-long Bismarck-Jamestown 230-kv transmission line No. 2 were completed in February 1961. Stringing of conductor and overhead ground wire on this line was completed in June 1961.

Foundations and towers for the 84-mile-long Jamestown-Fargo 230-kv transmission line No. 2 were about 95 percent complete, as of June 1961, in 83 percent of the contract time. Field work on foundations and towers for the 136-mile-long Garrison-Jamestown 230-kv transmission line was about 30 percent complete in 50 percent of the construction with foundation work in progress and tower steel bein erected.

Construction of the 114-mile-long Garrison-Minot-Rugby 115-k transmission line was started in July 1960. The section crossing th Snake Creek Reservoir-Garrison Reservoir embankment was completed; the remainder was about 95 percent complete at the end o June 1961 in 75 percent of the contract time. Construction of th 110-mile-long Jamestown-Grand Forks 115-kv transmission line No. was about 40 percent complete in 75 percent of the contract time by th end of June 1961.

## *Tornado Fells Towers*

Tornadic winds in North Dakota on July 10, 1960, blew down 1 steel towers of the Jamestown-Fargo 230-kv transmission line No. 1 Reconstruction was completed within that month using an emergenc contract.

Construction of Stages 03 and 04 additions to the Fargo substatio was completed in November 1960. Construction of the Stage 04 additions to the Jamestown substation was complete at the end of Jun 1961 except for installation of Government-furnished transformers Stages 03 and 04 additions at the Bismarck Substation were complete in May 1961.

Construction of foundations and towers for the 57-mile-long Oahe-Fort Thompson 230-kv transmission line was about 80 percent complete in 60 percent of the contract time by the end of June 1961 Field work on the foundations and towers for the single-circuit transmission line approaches at the Oahe and Fort Randall switchyards was started in May 1961. The contractor started stringing operations in June for the addition of second circuit conductors on the 337 miles of Fort Thompson-Huron-Watertown, Fort Randall-Sioux City, and Fort Randall-Fort Thompson 230-kv transmission lines. The contract was awarded in May 1961 for stringing second circuit conductors on 74 miles of previously constructed Watertown-Granite Falls 230-kv transmission lines.

Construction of the 213-mile-long Sioux City-Spencer and Sioux City-Denison-Creston 161-kv transmission lines was started in April 1961. Construction of Stage 04 additions to the Granite Falls substation and Stage 03 additions to the Tyndall Substation were both completed in September 1960. Stage 03 additions to the Huron Substation were about 95 percent complete at the end of June. Construction of the Fort Thompson substation, Stage 01, was started in July 1960 and had reached 70 percent completion, about on schedule.

Work had been started on Stage 03 additions to the Rapid City substation, Stage 04 additions to the Sioux City substation, and Stages 08 and 09 additions to the Watertown substation. A contract was awarded in April 1961 for construction of a multichannel microwave radio communications system to link all Missouri River Basin powerplants and substations in the South Dakota power system.

## *Twelve-Year Construction Effort*

In the Bostwick division, Missouri River Basin project, construction of the last section of the White Rock extension canal was completed in April 1961, to bring to a close major construction in this area extending over a period of 12 years.

In the Frenchman-Cambridge division, Missouri River Basin project, reconstruction of the last section of the old Culbertson Canal and construction of the first section of the Culbertson extension canal and lateral system was completed. The second section of the Culbertson extension canal and lateral system was about 95 percent complete at the end of June 1961 in about 68 percent of the contract time. Construction of Red Willow Dam in Nebraska was started in June 1960, and had reached about 35 percent completion by the end of June 1961 in 60 percent of the contract time. The outlet works was about 90 percent complete. Initial clearing of the reservoir was started in June 1961.

In the Middle Loup division, Missouri River Basin project, construction of Sherman Dam in the Farwell Unit, Nebr., was about 80 percent complete and about on schedule. Clearing of the Sherman Reservoir was completed. Construction of the Arcadia Diversion Dam was started and the work was about 20 percent complete in 35 percent of the contract time at the end of June 1961. The first section of the Sherman Feeder Canal had reached about 45 percent completion in 35 percent of contract time. A substantial amount of canal excavation had been accomplished on the second section of the Sherman Feeder Canal and tunnel excavation started. The work is about 30 percent complete in 35 percent of the contract time.

In the Oregon Trail division, Missouri River Basin project, the first generator in the Fremont Canyon powerplant was placed in operation in December 1960 and the second in January 1961, and all work was completed in March 1961. Completion of the Gray Reef Dam in the same division was completed in May.

Construction of Merritt Dam in the Sandhills division, Missouri River Basin project, was initiated in April 1961 and at the end of June was about 10 percent complete in 12 percent of the contract time.

*Trinity Dam, Bureau of Reclamation's largest earth-filled structure, backs up th Trinity River in northern California.*

In the Smoky Hill division, Missouri River Basin project, th modification of existing outlet works at Cedar Bluffs Dam was abou 60 percent complete in 98 percent of the contract time. Constructio of the Cedar Bluff Canal was started in 1961, and is about 10 percen complete in 30 percent of contract time. Construction of the secon section of Cedar Bluff Canal was started in June.

In the Solomon division, Missouri River Basin project, the fourt section of the Osborne Canal was completed in April 1961.

In the Transmission division, Missouri River Basin project, con struction of the 140-mile-long Kortes-Cheyenne 115-kv transmissio line was completed in November 1960, and the 115-kv additions to th Cheyenne substation for terminal facilities for this line were complete in September 1960. Construction of the 65-mile-long Cheyenne-Pin Bluffs-Sidney 115-kv transmission line was nearly complete at the en of June in 75 percent of the contract time. Construction of the Kim ball substation and 115-kv addition to the Sidney substation were bot underway. Construction of a multichannel microwave radio com munications system between the Flatiron Dispatch Office at Lovelan Colo., and the Cheyenne substation was essentially complete at the en of June 1961.

Principal features completed on Bureau projects in fiscal year 1961 e shown in table 2. The list includes six storage dams, seven diver- on dams, and 462 miles of canals, pipelines, laterals, and drains; as ell as 558 miles of transmission lines.

### fety-Contractor Forces

The Bureau continued to emphasize its safety program in the evention of accidents through administration of sound safety prac- es and corrective measures to control hazards associated with heavy nstruction work. Significant progress was made by reducing the ntractors' overall frequency rate 16 percent below the previous year's cident rate.

In this effort to reduce disabling injuries in Bureau construction erations and reduce construction cost resulting from accidents, con- cts and specifications now include the following safety provisions quiring each contractor to (a) submit a proposed safety program the contracting officer for approval prior to start of construction erations, (b) designate a competent contractor supervisory employee ponsible for administration of the contractor's safety program, (c) d weekly 5-minute "on-the-job" safety meetings conducted by all ntractor foremen, and (d) provide first aid training for all super- ors of mechanics and laborers engaged in construction.

## *Engineering Design and Research*

The Bureau continued during the fiscal year to develop engineering igns and design standards that will produce savings in the con- uction, operation and maintenance of its engineering works. This tinuing effort benefited by the studies of a three-man team of lamation engineering specialists who visited several European ntries to examine at first hand practices and procedures employed he investigation, testing, design, and construction of concrete dams.

The importance and value of saving water otherwise lost in transit ough canals is recognized. An appraisal of research and develop- nt work in the lower-cost canal lining program showed savings to tern water users of more than $20 million in the construction of gation canals over the past 15 years.

The search for better methods to locate and measure seepage con- ued. Several new installations of buried plastic Butyl rubber ets as a membrane to prevent seepage were installed in canals ing the year.

*Men and machines place and compact earth in Navajo Dam on the San Juan River in New Mexico.*

Experience of the past year in the field of earth dam design brought about a better understanding of the many complex variables involved. Special attention was concentrated on the analysis of foundation conditions from the standpoint of water retention and stability of soft foundations.

The feasibility of obtaining power from the electric field surrounding energized transmission lines was investigated. The electrical analogy tray apparatus was used to evaluate the mutual capacitance between the various conductions and between the conductors and ground. The techniques of noise control and the equipment necessary for detecting and analyzing noise sources in powerplants and pumping plants were studied. Noise control is now being considered in the original design of powerplants and pumping plants to eliminate correction of the conditions after the plant is built.

Field tests on two pumping plants where water column separation could be induced demonstrated the propriety of present Bureau design policy. Such policy calls for the design of water conduits for pumping plants so that water column separation cannot occur under any condition of operation.

During the year studies were started on the use of high strength reinforcement bars in precast reinforced concrete pipe. The high-strength bars, a relatively new product, have a yield strength of 60,000 pounds per square inch compared to 40,000 pounds per square inch yield strength for conventional reinforcement steel. The increasing use of precast concrete pipe in distribution systems gives great importance to this development.

## *New Technique Developed*

A technique was developed and used for the first time at Yellowtail damsite to determine characteristics of abutment and foundation rock. Equipment and instruments were designed and utilized to increase the knowledge on properties of rock in place. The technique will be used at other damsites.

A new procedure in the preparation of specifications drawings showing geologic logs of drill holes released trained draftsmen for other work, increasing production. The use of typewritten notes in lieu of machine lettering equipment is the basis of the new technique. The altered procedure is aided by a new heat-resistant adhesive for plastic drafting film.

Studies were started on preliminary data for design of a 345-kv single-circuit, steel tower transmission line from Glen Canyon to Flagstaff to Pinnacle Peak (north of Phoenix, Ariz.). Basic information such as conductor size and arrangement, hardware, insulation, mechanical loading assumptions, climate, and corona limitations are among the points being studied. The transmission line will be unique for the voltage because a large percent of the length of the line will be in the 6,000- to 8,000-foot range of elevation.

## *Remote Powerplant Control*

To minimize operating expenses, larger powerplants are being designed, where practical, for remote supervisory control. Current designs provide semiautomatic, pushbutton start-and-stop type controls at the Trinity, Clear Creek, and Spring Creek powerplants. Operation of these three plants and the control of water from the Keswick Control Center will save operating costs. All large plants being designed by the Bureau are being provided printing annunciators. This equipment will provide a permanent record which will give an accurate sequence when troubles occur. Operators will be relieved of such recording duties.

Specifications for high-speed voltage regulators for generators were revised extensively to incorporate improved methods of specifying performance. The new requirements are based on definitions of performance which appear in a proposed standard prepared by the AIEE subcommittee on excitation systems.

Through the increased use of electronic computing equipment for engineering studies, Bureau of Reclamation engineers are further relieved from many routine calculations.

Calculations were produced for such diverse engineering problems as the determination of power flows in interconnected high-voltage power systems; earthwork quantities for canals, highways, and railroads; analysis of control data for concrete and earthwork structures; design studies for dams, powerplants, pumping plants, and other structural features.

Electronic computer program studies during the fiscal year aided in the development of more advanced designs and more efficient use of engineering materials. Studies included investigation of the development of uniform Bureauwide ADP procedures for nonexpendable movable equipment; crop census reporting; studies to determine capacities of large canals; statistical analyses of earthwork and concrete control data; structural designs of walls, slabs, and frames for powerplants and pumping plants; calculation of deflections in concrete dams; power system average rate and repayment studies; design and analysis of structures on elastic foundations; non-linear multiple correlations; hydrology system operation studies; and calculation of loss factors for electrical power systems.

A revised procedure was developed and implemented for processing Bureauwide real property data to produce useful current information as well as that required for periodic inventory and status reports on real property.

### *Evaporation Reduction Tests*

Full-scale evaporation reduction tests were performed at Sahuaro Lake, Phoenix, Ariz., in cooperation with the Department's Geological Survey, Salt River Valley Water Users Association, U.S. Public Health Service, and the Arizona State Fish and Game Department. A new automatic technique of applying the monolayer-forming material in melted form was employed with encouraging results. A manual method of applying the monolayer-forming material with agricultural dusting equipment mounted on a boat also proved effective. The Sahuaro Lake investigations showed evaporation savings of about 14 percent for over a 6-week period using a mixture of hexadecanol and octadecanol as the monolayer-forming material.

In preparation for a full-scale evaporation reduction field test during the summer months of 1961 at Cachuma Reservoir, Calif., pre-

*A dynamite blast launches preliminary construction on Yellowtail Dam on the Big Horn River in Montana.*

vailing climatic conditions at the reservoir were studied and further research and development on the automatic dispensers were carried out. Twelve dispensers were built and installed at the reservoir. The Cachuma investigations are in cooperation with the Geological Survey, Cachuma Operation and Maintenance Board, Santa Barbara County Department of Parks, and the City and State Health Departments.

Aerial applications of the monolayer-forming material were field tested at Utah Lake in a cooperative program with the Utah State University. Preliminary studies were highly encouraging for this method of applying monolayers to large reservoirs. Evaporation losses in the 17 Western States total about 25 million acre-feet annually.

Concrete containing certain types of aggregate when exposed in a moist environment to freezing-thawing conditions is sometimes affected by surface deterioration in the form of popouts, scaling, and spalling. On large projects remedial measures such as heavy media separation are feasible economically, and they are being presently used for aggregates at Glen Canyon and Flaming Gorge Dams. On smaller projects, cost would preclude such treatment, and to protect the concrete surface from deterioration, other means such as surface treatment may be the answer. Investigations of such treatments as epoxy resin, linseed oil, and silicones were started to determine their effectiveness in reducing freezing-thawing deterioration of concrete.

### *Improving Asphaltic Concrete*

Preliminary research on improving asphaltic concrete for lining canals and reservoirs and facing dams showed that an epoxy-resin additive contributes to a higher quality mixture, exhibiting considerably greater compressive and tensile strengths and stability after aging. Other investigations into the performance of asphaltic concrete indicate that asbestos fibers produce a pronounced increase in tensile strength and stability. By using the finer fibers (low-cost waste screenings), a watertight material can be obtained. A new method for tensile testing of 4-inch-diameter asphaltic concrete test cylinders was developed to facilitate study of the correlation between compressive and tensile strengths.

A comprehensive report was published describing laboratory and field tests made so far in the study of epoxy resins for use in repairing concrete. New studies of epoxy-resin compounds were started on applications as decorative finish floors similar to terrazzo, as nonskid surfaces, and as surface treatments to protect concrete from freeze-thaw damage.

Model and field testing of jetty fields used in river channelization have produced sufficient data to permit generalization of design procedures. Analysis of the data and recommended design principles have been published in a form applicable to the solution of future channelization problems.

Investigations related to the carrying capacity of large canals were continued. Field tests on large concrete lined canals have revealed that resistance to flow from concrete surfaces increases with age, thus gradually reducing the carrying capacity. Preliminary trials of a model test facility designed to measure resistance coefficients of typical concrete surfaces demonstrated that laboratory values were of the same order of magnitude as field measured values. This will be a valuable tool for the further study of carrying capacity of large canals.

The results of preliminary investigations of the dissolved oxygen content of streams and reservoirs were reported. Particular attention was given to improving chemical methods of determining dissolved oxygen content. In these first tests, no significant oxygen deletion was found in waters tested on the Bureau's Colorado-Big Thompson project of Colorado.

## *Brackish Water Conversion*

In cooperation with the Department's Office of Saline Water, operation and testing was continued of different electrodialysis demineralization units, including a large demineralizer unit with two types of membranes manufactured in the Netherlands. A field test station was constructed, including installation of a four-stage demineralizer unit which was operated on a supply of brackish well water. Data obtained in these testing operations were used in the analysis and review of contractors' proposals for the Office of Saline Water electrodialysis demonstration plant at Webster, S. Dak.

An investigation was conducted on the type of steel required for pumps used with brackish water in demineralization pilot plants. Stainless and mild steels were compared for resistivity to corrosion and impingement attack. The need for a high alloy stainless steel was clearly demonstrated.

In some areas of the western United States there are loose soils which subside upon initial wetting when water seeps through irrigation conveyances. By correlating simple laboratory tests with field nstallations and test plots where known subsidence has occurred, a procedure was developed to provide a convenient measurement for ndicating susceptibility to subsidence. The procedure is now finding important use in the investigations of subsidence problems connected with the San Luis Canal, Calif.

A portion of the Bureau's research program was financed this fiscal year with nonreimbursable funds. Congress, in appropriating such funds, recognized that much of the agency's research had benefited more than one project, and by advancing the art in engineering had general applicability to future projects and to the engineering profession as a whole. A new material, a new method, or a new concept permitting more economical design may result from studies for a single project. The economies achieved are often duplicated on similar projects built by the Bureau in the future.

Nonreimbursable research covered many varied fields—the development and improvement of construction materials, protective coatings for submerged and buried steel, the lining for canals, the structural behavior of rock foundations, and in specialized fields such as the reduction of evaporation from reservoirs through the use of monomolecular films.

Under nonreimbursement research, appreciable progress was made during the fiscal year on studies to determine the possibilities of

*Prineville Dam on the Crooked River in Oregon stands completed.*

greatly increasing power capacity of generating units in large powerplants. Investigations have been made relative to installation of a 300,000-kw generator on a single shaft from one turbine. The investigations were still in progress at the end of the fiscal year but tentative conclusions are that such units are entirely feasible and that improvements in economy of powerplant construction may be realized.

## *Foreign Contracting*

Twenty-eight contracts totaling $3,109,383 were awarded to companies offering foreign manufactured equipment, including five Eng-ish, five Austrian, five West German, five Canadian, three Italian, two French, and one each Swiss, Japanese, and South African. Twenty of these were for electrical equipment. Two were for hydraulic turbines, one of which was the first contract to be awarded to a Japanese manufacturer. Two contracts were awarded for hoists, and one each for fixed-wheel gates, hollow-jet valves, strain meters and monometers, and electronic distance measuring instruments from South Africa.

Construction costs on Bureau projects increased about 1 percent during fiscal year 1961. Construction wage rates increased about 5 percent for the same period, while most construction material costs remained fairly stable.

The number of bids on Reclamation construction work decreased from an average of 7.4 bids received on each construction schedule in fiscal year 1960 to an average of 6.5 bids per schedule for the current fiscal year. This compares with an overall average of 6.3 bids per schedule for the past 10 years. Table 3 shows cost indexes for Bureau of Reclamation construction work based on the combined cost of materials and labor supplied by the contractor, and materials supplied by the government.

### *New Reference Works Issued*

Two major reference works were issued during the year—the 873-page Reclamation Project Data and the new edition of the Earth Manual.

The project data publication provides information on 145 Federal water resources projects and units of projects initiated or completed during the Bureau's first 57 years. Included in the volume are tabulations of engineering data on Bureau structures, a glossary of technical terms, and a project location map. Similar data books, increasing in size and scope as the Bureau program expanded, were published in 1945 and 1948 as an outgrowth of a reference brochure first published in 1941.

The 1960 edition of the Earth Manual was published as a successor to the 1951 edition. The manual provides current technical information relating to field and laboratory investigations of soils used as foundations and materials for dams, canals, and many other types of structures built on Reclamation projects in the United States. The Bureau's many years of experience in investigating and testing the various properties of soils relating to engineering uses is incorporated in the publication.

Also published were technical records on the design and construction of Nimbus Dam and powerplant, Palisades Dam and powerplant, and Helena Valley pumping plant and tunnel. Three engineering monographs on petrographic and engineering properties of loess, calculation of stress from strain in concrete, and moments and reactions in rectangular plates were issued during the year. The latter publication has done much to alleviate the problem of design of wall and floor slabs for retaining walls.

In response to 7,350 requests for the Bureau's publications and informational materials, 38,000 copies of technical publications and informational pamphlets were sold or distributed. Sales of Reclamation publications totaled $37,630. Approximately half of the total sales revenue came from foreign countries, an increase of 60 percent over last year. Publications sold for the Superintendent of Documents totaled $17,678, an increase of approximately 30 percent over last year.

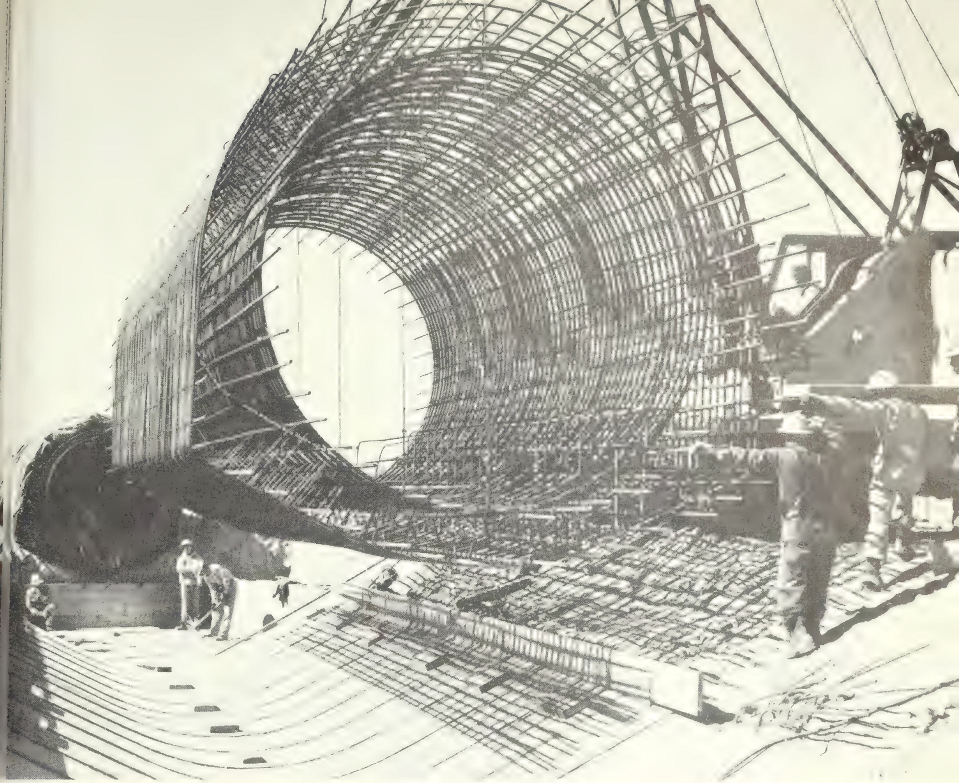
Engineers, scientists, and subprofessional employees of the Bureau hold offices on the national level in professional societies ranging from "task-force" worker on special committees to president in such groups as the American Society of Civil Engineers, American Society of Testing Materials, American Concrete Institute, U.S. Committee on Large Dams, World Power Conference. Included are numerous memberships on technical committees and chairmanships. More than 60 national or regional meetings were attended and technical papers authored by Bureau personnel were presented. Many of these papers were nationally received and recognized and were published in leading technical or society publications and journals.

The Bureau also published Bureau of Reclamation Appropriation Acts and Allotments, a 1,000-page chronological compilation, and Engineering Careers in Reclamation, a 50-page booklet designed to interest graduating students in working for the Bureau.

A new motion picture on the Colorado River storage project, Key to the Future, was produced. The Bureau also produced a film strip, The Miracle of Water, which briefly covers the story of Reclamation.

## *Irrigation and Land Use*

The 1960 harvest of crops on irrigated farms in Reclamation projects was valued at $1,157,528,693. These farms contained 6,899,711 irrigated acres, making the average gross crop return amount to $167.76 per acre. The 1960 crop year established new records in Reclamation crop returns.



*A 14-ton steel cage for section of outlet works is lowered into position at Red Willow Dam on the Missouri River Basin project in Nebraska.*

The irrigated area under Reclamation projects was 96,686 acres greater than in the preceding year. Since 1920 the annual growth rate of the Reclamation area has been fairly constant, averaging 3 percent per year.

Projects added to the Reclamation area in 1960 were the Boysen, Frenchman, and Webster Units of the Missouri River Basin project and the Wapanitia project. Their combined irrigable area for service was 27,844 acres.

Reclamation farms numbered 128,224, and averaged 64 acres. The farm population was 524,930 persons—an average of 4 per farm.

Reclamation farmers produced a wide array of readily marketable crops. Vegetables comprised 22 percent of the total value, fruits and nuts 15 percent, and miscellaneous field crops 8 percent. Twenty-nine percent of the gross crop value came from feed and forage crops. Reclamation contributes little, if any, to the surplus crop categories.

From 1906 to 1960, the cumulative value of all Reclamation harvests amounted to $16,532,586,077. The 1960 crop value was as great as the value of all the Reclamation production through 1925.

The average dollar's worth of farm production on Reclamation projects was enhanced by another 57.5 cents worth of processing accomplished at local crop and livestock processing plants. The direct income components—wages, interest, and profits—make up approximately half of the local processing cost.

### *Operation and Maintenance of Irrigation Works*

The Review of Maintenance Program was carried forward to insure the safety and effective operating condition of all structures and facilities which are essential for protection of the investment in these facilities by the United States.

The continuing long-standing policy of transferring the care, operation, and maintenance of irrigation facilities to water user organizations was implemented with the transfer of the complete irrigation systems of the Michaud Flats project and the Roza division of the Yakima project to the respective water user organizations. In addition to these two systems, serving approximately 84,000 acres, five dams and storage reservoirs, three diversion dams, three equalizing reservoirs, several pumping plants, canal, aqueducts and wells were transferred.

The Bureau performs operation and maintenance of completed irrigation facilities of projects under construction, where public lands have been developed and a water user organization must be organized, and when the activity involves international and interstate deliveries under compact commitments. At year's end the Bureau had transferred the operation and maintenance to local water user organizations of 46 percent of storage reservoirs, 70 percent of diversion dams, and distribution facilities serving 90 percent of the irrigable lands.

### *Weed Control*

The Bureau of Reclamation is continuing its comprehensive weed control program which has proved very effective in reducing the problems caused by undesirable vegetation. Operation and maintenance costs caused by weeds have been decreased and the program is aiding materially in reducing water losses resulting from transpiration, evaporation, and seepage.

More efficient and economical methods of controlling weeds infesting banks and channels of irrigation and drainage systems are being developed through the research program conducted in cooperation with the Department of Agriculture. This phase of the program is being accomplished at four field stations in the West, and in the

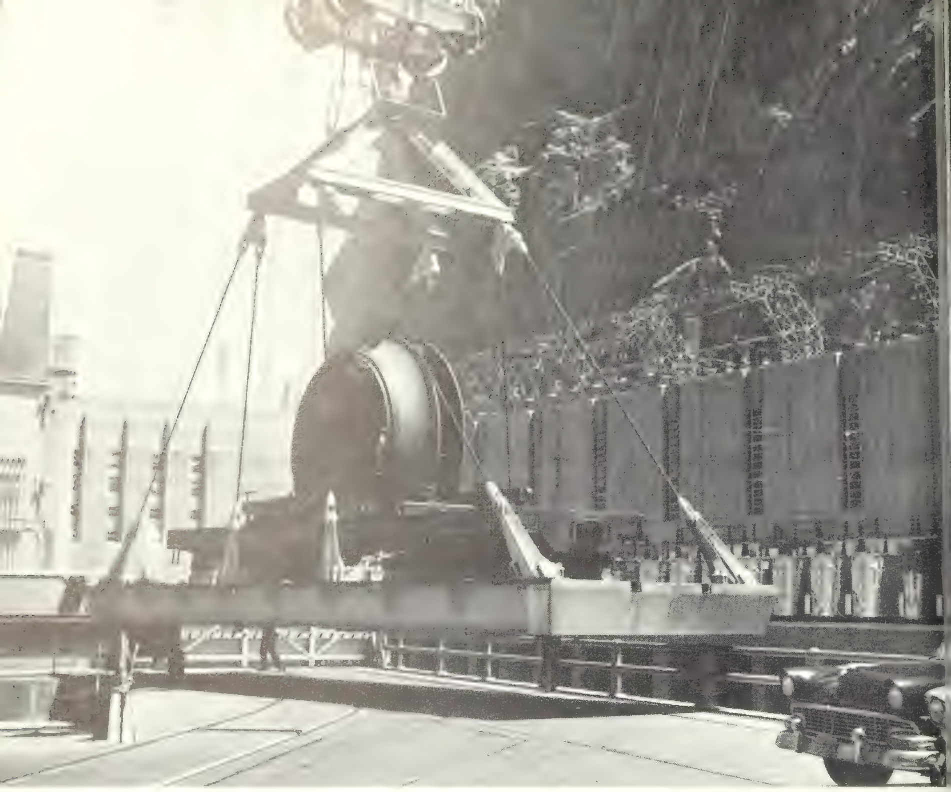
Assistant Commissioner and Chief Engineer's weed control laboratory in Denver.

From a recent survey it was estimated that nearly 2 million acre-feet of water is lost each year due to weeds on irrigation systems in the 17 Western States. It was similarly estimated that the total costs and losses caused by these weeds were about \$5¾ million. Even though this figure is high, the relatively small investment in research and education has prevented an additional \$15.8 million in costs and losses. Research is being continued to aid in solving this major irrigation problem. However, much more research is seriously needed to further reduce these costs and losses.

Progress was made in developing more effective methods for controlling woody phreatophytes, including salt cedar, where these plants have invaded irrigation systems, natural water courses, reservoirs, and other areas. These growths not only usurp millions of acre-feet of water so greatly needed for irrigation, municipal, and industrial purposes, but also increase flood hazards and take over lands which should be used for grazing and agriculture. It is estimated that in the 17 Western States, all undesirable phreatophytes nfest over 15 million acres and transpire at least 25 million acre-feet of water annually. The Department of Agriculture and the Department of the Interior have committees of specialists who are working ointly on this and other weed control problems common to the Government agencies.

Aquatic weed control investigations performed in cooperation with he Agricultural Research Service so far indicate that vinyl-base antifouling paints containing high concentrations of cuprous oxide are particularly effective in inhibiting the attachment of algae on structures of irrigation systems. Many new herbicides were evaluated as aquatic weed killers through bioassay tests. One chemical showed particularly promising results as an aquatic herbicide in soil application, and was placed under field test. By studying behavior under controlled conditions, much was learned concerning the response of aquatic plants to herbicidal applications under varying environmental conditions.

A halogeton control program has been developed in cooperation with other agencies under the provisions of the Halogeton Glomeratus Act in the interest of increasing the land use value of the lands under the jurisdiction of the Bureau and of protecting the livestock which graze on these lands. It is known that this poisonous weed infests Bureau lands in Utah, Nevada, Colorado, Wyoming, and Idaho. Surveys to locate halogeton infestations and cooperative investigations to determine the most effective and economical control methods



*The 115,000-horsepower turbine runner for Hoover Dam's 17th and final hydroelectric generating unit arrives for installation.*

were continued this year. The actual control programs, including chemical spraying and grass seedings were continued primarily through agreements with the Bureau of Land Management.

The distribution of motion pictures, slides lectures, manuals, special releases on new equipment, and articles in *The Reclamation Era* have been continued to advise project personnel on new and more economical methods for controlling weeds.

### *Development Farms*

The practice of establishing development farms on new irrigation projects has removed many of the factors which caused hardships and often failures of settlers on earlier developed projects. The development farms not only demonstrate more efficient and economical irrigation practices, but also show the value of conserving soil and water through promoting more efficient use of these important natural resources. This phase of conservation is especially important in view of our increasing population and the decreasing areas suitable for agricultural development.

Development farms are established as far as possible in advance of settlement, usually 2 to 5 years, in order that much of the necessary experience and information will have been obtained when the new settlers arrive. The farms are located in areas which best represent the soils and other conditions of the new project. The sites are chosen and the plans for the development and operation of each farm are formulated in cooperation with State Colleges, Department of Agriculture, and other interested agencies.

The major portion of each farm is devoted to field scale demonstrations of approved farm irrigation systems, irrigation methods, kinds and varieties of adapted crops, cultural practices, most effective fertilizers, weed control, farm drainage, and solutions to other problems faced by new irrigation farmers. From 10 to 25 percent of most of the farms is set aside for research, which is conducted by State College Experiment Stations and cooperating agricultural agencies such as the Agricultural Research Service and the Soil Conservation Service. Methods developed from research are thoroughly tested and demonstrated on the farms. Some of the farms have served the additional purpose of aiding in determining the feasibility of projects.

The Bureau of Reclamation and other agencies responsible for the development farms work closely with the State College Extension Services to be certain that the information from research findings and demonstrations is properly disseminated to the new settlers. Hundreds of farmers attend the annual field days and tours at which representatives of the Bureau and the cooperating agencies explain the work in detail. The settlers are encouraged to visit the farms at any time during the year to obtain information. Pamphlets are prepared and distributed which supply data on the crops raised, yields, and other pertinent information. In addition to project farmers the development farms benefit college and high school students who visit the farms with their instructors.

Seven development farms were in operation during fiscal 1961. Twenty-one farms previously operated have been discontinued because they have served their purpose. Additional farms are proposed for new areas scheduled for development.

The Bureau of Reclamation has continued its program of conserving soil and water on lands under its jurisdiction in keeping with the Department's policy on conservation of natural resources. These operations are directed primarily toward erosion control, reduction of water losses, and the protection of Reclamation-built works.

The program includes planting grasses and trees, building structures, and carrying out other desirable erosion control and soil stabilization practices: controlling undesirable water consuming vegetation and placing structures to protect irrigation facilities. Specia research is conducted in prevention of water losses caused by evaporation, transpiration, and seepage. The program objectives are accomplished in cooperation with other Federal agencies as well as state local and water users' organizations. During fiscal year 1961 ther were 115 individual soil and moisture conservation programs on 6 Federal irrigation projects or units.

### *Cooperation With Other Agencies*

The Bureau's activities in planning, developing and operating Federal irrigation projects and in the conservation of natural resource on lands under its jurisdiction have been greatly facilitated through cooperation with other agencies and organizations. Their special skills, experience and equipment have been fully utilized whenever it was to the advantage of the Government to do so.

The cooperative work is implemented by means of agreements between the Bureau and the other organizations involved which now include several agencies within the Department of Agriculture and the State Colleges and Extension Services of the 17 Western States and the State of Alaska, as well as many other Federal, State, and local organizations.

During fiscal 1961 there were 380 such cooperative agreements in effect. They include studies and investigations conducted on development farms, conservation activities, efficient use of soil and water, crop and cropping problems, assistance to county agricultural agents, and weed control. They cover also the development and management of reservoir, recreational, and wildlife areas, and assistance in solving many other problems pertaining to irrigation projects.

Cooperation with other agencies also includes active participation in numerous departmental, interdepartmental, basin, State, local and other committees whose functions are related to the Bureau's interests and responsibilities.

### *Land Settlement*

During the 1961 fiscal year, the Bureau of Reclamation conducted two land openings. The first such opening made 12 full-time farm units on the Columbia Basin project in the State of Washington available for purchase by qualified applicants. The second offered fourteen farm units on the Minidoka project, North Side pumping division, Idaho, for entry under Homestead and Reclamation laws.

*Sugar beets, grown here in Montana on the Missouri River Basin project, are one of the many diversified crops produced on Reclamation projects.*

Since the close of World War II, a total of 2,842 farm units consisting of 274,491 irrigable acres, has been made available for settlement either by homesteading or by purchase on 14 Reclamation projects.

Settlers do not pay for the public land which is opened to homesteading. Government-acquired lands are sold to settlers as farm units. In either case, settlers pay to the Federal Government, through an irrigation district, or other recognized water users' organizations, the pro rata share of the construction costs of irrigation facilities built to supply the land with water. They also pay an annual charge for operation and maintenance of the irrigation works. The construction costs are paid without interest over a long period, usually 40 or 50 years.

## *Community Development*

In completing the transfer of Boulder City, Nev., from the Federal Government to the then newly-created incorporated municipality on January 4, 1960, that portion of the municipal area known as Lakeview Addition was retained under Federal administration. Pursuant to the provisions of the Boulder City Act of 1958, the Bureau accelerated subdivision and improvement of this one remaining area. B early March 1961, streets and curbings had been constructed, wate and sewer lines installed, and related improvement work completed On March 16, 1961, the transfer of Lakeview Addition to the municipal corporation of Boulder City was formalized. This action completed the transition of Boulder City, Nev., from its original status o a Federally administered city to that of a self-governed municipalit under the laws of the State of Nevada.

Development has continued in the town of Page, Ariz., establishe in connection with the construction of Glen Canyon Dam, a principa feature of the Colorado River storage project. With initial subdivision completed and utilities available to serve the municipal area establishment of permanent commercial enterprise has gone forward rapidly. The principal business area now consists of a balanced complement of businesses from which customers can obtain both basic essentials and a variety of supplemental commodities and services. Concurrently with the commercial development, a gratifying acceleration occurred during the latter part of the year in financial commitments for private residential construction.

As construction activities on Glen Canyon Dam and powerplant diminish, it is expected that there will be a compensating increase in tourist and recreational activity which will adequately insure a sound basis for continued municipal growth and development in the town of Page.

Although the community is presently managed and administered by the United States, plans for the future are based on the assumption of functional management and administration of municipal affairs as soon as practical by an appropriately organized corporate entity. As soon as such a transition is practicable the municipality of Page, Ariz., will be given assistance in assuming a position of self-government comparable to that occupied by other municipalities in the State of Arizona.

### *Recreational Use of Reclamation Projects*

Recreational use of Reclamation projects in the 17 contiguous Western States continued to increase in 1960 as it has done during the past decade. This use at reservoirs and other project recreational management areas totaled 24.3 million visitor days, an increase of 1.6 million visitor days from the 22.7 million reported in 1959.

In 1960, recreational use was nearly four times heavier than in 1951, when 6.5 million visitor days were recorded, and more than vice as large as the 9.8 million days of use in 1955. These data do ot include recreational use of project lands, which are used mostly y project residents for upland game bird, game hunting and other ecreational activities, which are substantial.

As has been true in previous years, sightseeing was most important mong recreational users in 1960, followed by fishing, boating and ater skiing, and other uses. The following tabulation shows various se categories reported:

| *ctivity* | *Number of visitor days* | *Activity* | *Number of visitor days* |
|---|---|---|---|
| ightseeing | 9, 348, 448 | Swimming | 1, 735, 085 |
| ishing | 4, 445, 846 | Camping | 1, 348, 421 |
| oating and water skiing | 4, 107, 830 | Hunting | 348, 102 |
| icnicking | 2, 704, 480 | Other | 282, 590 |

Many of the older Reclamation reservoirs have inadequate public use facilities. The absence of general authority to construct such facilities with Federal funds not only results in reduced public recreational benefits, but also poses many problems for organizations having responsibility for public use administration of these areas.

The inequities of the present situation are being recognized on many new projects where nonreimbursable Federal funds have been and are being provided in project authorizations. In addition, specific legislation on a few of the older projects has been introduced to alleviate acute problems in those instances where recreational use has far outgrown the facilities available. General authority to overcome inequities at all other reservoirs where basic facilities have not been provided would make possible the realization of the recreational potential that exists in these areas.

## *Fish and Wildlife Benefits*

Construction of Reclamation projects often has a profound effect on fish and wildlife, particularly where waters of a stream are impounded to create a new reservoir. Usually some fish and wildlife values are destroyed while new ones are created. Occasionally, Reclamation reservoirs provide valuable additions to wildlife values as migratory bird refuges.

Enactment of the Fish and Wildlife Coordination Act on August 12, 1958 (P.L. 624, 85th Congress, 2d sess., 72 Stat. 503), strengthened Federal responsibility for fish and wildlife development on new Reclamation projects. Under this act, fish and wildlife are given equal consideration in the project development processes with other Reclamation functions. Occasionally, relative evaluation of the benefits to fish and wildlife and recreation are required in providing maximum public benefits from these corollary functions of Reclamation development.

## Project Development

The Bureau's project development program involves preparation of comprehensive plans for development of river basin resources and the investigation and planning of potential projects to meet the requirements of the fast growing population of the West for optimum utilization and conservation of its limited water resources. The program also includes detailed preconstruction studies on newly authorized projects.

### Comprehensive Basin Surveys

During the year, the Bureau, in cooperation with other agencies, was engaged in comprehensive surveys in 10 river basins throughout the West, including one subbasin of the Missouri River Basin. A preliminary draft of a proposed report on the Upper Snake River Basin, Oregon, Idaho, Wyoming, was completed and released to interested governmental and local interests as a basis for public hearings. Completion of that report by the Bureau of Reclamation and the Corps of Engineers jointly is now in progress. Miscellaneous minor items of investigation in connection with other river basin surveys were also active.

### Project Planning Reports

By the end of the year, project planning reports had been submitted to Congress on Agate Dam and Reservoir, Talent Division of the Rogue River Basin project, in Oregon, and on the Oroville-Tonasket Unit, Okanogan-Similkameen Division of the Chief Joseph Dam project in Washington. Planning reports on the Savery-Pot Hook project, Colorado-Wyoming, the Columbus Bend project in Texas, the North Loup Division of the Missouri River Basin project in Nebraska, and the Auburn-Folsom South Units of the Central Valley project in California were forwarded to the Bureau of the Budget to determine their position in relation to the President's program prior to their submission to the Congress.

Planning reports on the Arbuckle project in Oklahoma, the Waurika project in Oklahoma, the Upper Division of the Baker project in Oregon, the Merlin Division of the Rogue River Basin project in Oregon, the Crooked River project extension in Oregon, the Yolo-

*ecreationists enjoy one of Reclamation's multipurpose benefits on the Weber asin project's Echo Reservoir in Utah.*

amora Unit of the Central Valley project in California, and Buttes am and Reservoir of the Middle Gila River project in Arizona were ransmitted to affected States and interested Federal agencies for eview.

## *Definite Plans*

During the fiscal year, definite plans for authorized projects were ompleted on the Canadian River project in Texas, on the Cheney ivision of the Wichita project in Kansas, and on the revised plan for the Weber Basin project in Utah.

The planning report on the Crater-Long Lakes Division of the Snettisham project was submitted to the Congress. The report on the Devil Canyon project was under review by States and Federal agencies at the close of the year. Both projects are in Alaska.

## *Loan Program*

During the fiscal year there was more overall activity in the Bureau's loan programs to assist local development than during the preceding year. A résumé of activities under each of these two active loa programs follows:

*Total estimated cost of projects under the Small Reclamation Projects Act o 1956 (P.L. 984)*

| Status | Accumulative to— | |
|---|---|---|
| | June 30, 1960 | June 30, 196 |
| Notices of intent received | $99,797,000 | $116,674,00 |
| Loan applications received | 59,980,000 | 77,270,00 |
| Loans approved by Secretary | 57,800,000 | 57,800,00 |
| Designs and specifications approved | 19,217,000 | 47,951,00 |
| Construction initiated | 17,275,000 | 35,725,00 |
| Construction completed | 0 | 4,673,00 |

*Total estimated cost of projects under the Distribution System Act (P.L. 130)*

| Status | Accumulative to— | |
|---|---|---|
| | June 30, 1960 | June 30, 1961 |
| Notices of intent received | $26,406,000 | $69,770,00 |
| Loan applications received | 26,406,000 | 29,995,00 |
| Loans approved by Secretary | 26,406,000 | 29,995,00 |
| Designs and specifications approved | 20,584,000 | 26,406,00 |
| Construction initiated | 15,872,000 | 26,406,00 |
| Construction completed | 3,570,000 | 3,570,00 |

The emphasis of the loan program shifted from the examination and approval of applications and contract negotiations to the various construction activities. Late in the year, however, a number of new applications were received. The Hawaii Omnibus Act (July 12, 1960, 74 Stat. 421) extended authority for small project loans to Hawaii.

By June 30, 1961, four projects had been completed under this program. One, using a distribution system loan, was completed in fiscal 1960 and the other three, all utilizing small project loans, were completed during fiscal 1961. These loans totaled about $6,700,000 on projects costing $8,243,000. Fifteen other projects were under construction, or ready to start, by June 30, with loans totaling about $63,600,000. Three of these are distribution system loans while 12 are small project loans. Loans totaling $13,000,000 have been approved for four other small projects, but for various reasons construction had not been started by the end of the year.

Ten applications for loans totaling $20,434,000 were received during the year, including two for increases in previously approved loans.

### *River Compacts*

The Columbia River Basin Compact was approved by the Compact Commissioners of the several basin States on October 3, 1960. The Compact has been ratified by the Montana and Idaho legislatures.

The Lower Niobrara and Ponca Creek Compact between the States Nebraska and South Dakota was ratified by the two States and is vaiting consent action by the Congress.

When called upon, the Bureau has continued to provide technical sistance with respect to negotiations on the following unperfected ter-State compacts:

Arkansas River (Arkansas and Oklahoma).
Arkansas River (Kansas and Oklahoma).
Cheyenne River (Wyoming and South Dakota).
Little Missouri River (Wyoming, Montana, and North Dakota).
Niobrara River (Wyoming, South Dakota, and Nebraska).
Red River (Arkansas, Louisiana, Oklahoma, and Texas).
Truckee-Carson-Walker Rivers and Lake Tahoe (California and Nevada).

## *Hydrology*

The Hydrology Branch has continued to study the hydrologic asects of proposed water resource development projects. These studies nclude, but are not limited to, evaluation of the quantity and quality f water supply in relation to the multiple-purpose requirements, determination of the amount and distribution of sediment load and its leposition, and potential flood magnitudes and frequencies as the basis f design. The requirements and limiting factors for selective withlrawals of water from reservoirs for controlling temperature of reeases to aid in the spawning of salmon were studied with reference o provision of facilities in several water resource developments.

An improved method was developed to predict the amount and easonal distribution of return flows from irrigation under certain nown conditions. This will aid in the planning for reuse of rrigation return flows.

The basinwide hydrometeorological study of maximum probable storms for use in the design of spillways for dams in the Rogue River Basin was completed, and a similar study for the eastern slopes of the Sierra Nevadas was continued.

Coordination continued with the Corps of Engineers, Department of the Army, in the preparation of flood control operating rules for several Bureau reservoirs. Studies were continued of emergency operating rules for use in spillway design.

Cooperative investigations of the effects of land treatment and conservation practices on yield of streams were continued with the Agricultural Research Service and the Soil Conservation Service of the Department of Agriculture.

Studies were initiated on the efficiency and operation of sediment excluder devices and settling basins.

Studies were continued of the changes in the regime of strea channels resulting from the construction of dams or from the wit drawal or addition of water to the natural stream system.

### *International Streams Investigations*

The Bureau of Reclamation is represented on two Internationa Engineering Boards of the International Joint Commission. Unde the Reference of January 12, 1948, the Souris-Red Rivers Enginee ing Board through interested Federal agencies reported on the pos sibilities of a joint plan of development of the Pembina River by th United States and Canada, and continued the systematic collectio and study of hydrologic data and related flood control and irriga tion investigations in the Souris, Red, and Missouri River Basin The Waterton-Belly Rivers Engineering Board was not active durin the fiscal year in connection with the Waterton-Belly Rivers Referenc of January 12, 1948.

## *Hydroelectric Power Development*

In order to utilize to the greatest advantage the irrigation wate supplies made available by multipurpose reservoirs, the Bureau o Reclamation in its program of aiding in the development of America water resources has constructed and, as of June 30, 1961, is operatin 42 powerplants with an installed nameplate capacity of 5,199,55 kilowatts. In addition, the Bureau is responsible for marketing th power generated at four powerplants constructed by the Corps o Engineers with a total installed nameplate capacity of 985,03 kilowatts and one powerplant installed by the International Boundar and Water Commission, with a total nameplate capacity of 31,50 kilowatts.

Sale of electric power by the Bureau during the year aggregate 27,446 million kilowatt-hours, with revenues from sales totaling $72,743,347.

### *Fiscal Year Expansion*

During the fiscal year the installed nameplate capacity of hydroelectric powerplants at Bureau of Reclamation multipurpose projects and at projects for which the Bureau is responsible for marketing the power was increased 288,000 kilowatts.

As a result of water conservation works, the Bureau placed into operation during the year on the Glendo Unit of the Missouri River Basin project, the Fremont Canyon hydroelectric powerplant with n installed nameplate capacity of 48,000 kw. Also during this eriod, the U.S. Army Corps of Engineers completed installation of vo additional generating units each with a total capacity of 240,000 w, at its Fort Peck and Garrison powerplants, the power of which marketed by the Bureau.

### *Additional Capacity Under Construction*

At the end of the fiscal year, the Bureau of Reclamation had under onstruction nine powerplants which will have an ultimate installed ameplate capacity of 1,605,850 kilowatts. They are listed below:

| Plant | Project | River | State | Nameplate capacity (KW) |
|---|---|---|---|---|
| ear Creek | Central Valley | Trinity | California | 134,000 |
| wiston | do | do | do | 350 |
| ring Creek | do | do | do | 150,000 |
| inity | do | do | do | 100,000 |
| pper Molina | Collbran | Colorado | Colorado | 8,640 |
| wer Molina | do | do | do | 4,860 |
| len Canyon | Colorado River Storage | do | Arizona | 900,000 |
| laming Gorge | do | Green | Utah | 108,000 |
| ellowtail | Missouri River Basin | Big Horn | Montana | 200,000 |

The Bureau is also proceeding with the installation of Unit N–8 with a rated capacity of 95,000 kw at the Hoover powerplant on the Boulder Canyon project. This unit, scheduled to be in operation by December 1, 1961, is the last unit that will be installed in this plant nd when completed will increase Hoover powerplant to its nameplate planned capacity of 1,344,800 kw.

The Corps of Engineers is proceeding with the construction of its Big Bend and Oahe plants in the Missouri River Basin project. The ultimate installed nameplate capacity of the Big Bend and Oahe powerplants in South Dakota will be 468,000 kilowatts and 595,000 kilowatts, respectively. The Bureau of Reclamation will be the marketing agent for energy generated by these new plants, as is the case for other plants constructed by the Corps on the Missouri River Basin project.

The hydroelectric powerplants constructed and operated or under construction by the Bureau of Reclamation and powerplants for which the Bureau is the marketing agent are listed in table 5.

### *Transmission System*

To provide the electrical energy for the Bureau's projects and to market the power which is surplus to the Bureau's needs, a transmission system including powerplant substations, switchyards, and transmission lines, has been constructed. During the fiscal year end-

*Engineers operate sluice gate of model in Bureau of Reclamation research laboratories in Denver.*

ing June 30, 1961, approximately 558 circuit miles of transmission lines were completed resulting in a total system of 10,704 circuit miles of line. As of June 30, 1961, the installed transformer capacity of the individual substations operated by the Bureau was 11,512,271 kva.

The transmission lines completed in fiscal year 1961 are as follows:

*Transmission lines completed during fiscal year 1961*

| Project and line | Voltages (kilovolts) | In service data | Circuit miles |
|---|---|---|---|
| Columbia Basin project: | | | |
| Jericho substation to Sand Hollow pumping plant | 13.8 | July 1960 | 2.84 |
| Missouri River Basin project: | | | |
| Fort Peck powerplant to Dawson County substation. | 230 | June 1961 | 105.20 |
| Dawson County substation to Bismarck substation | 230 | November 1960 | 209.00 |
| Bismarck substation to Jamestown substation—Line No. 2. | 230 | July 1961 [1] | 99.33 |
| Kortes Powerplant-Cheyenne substation | 115 | November 1960 | 141.57 |
| Total | | | 557.94 |

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[1] This was completed in fiscal year 1961 but was not placed in service until July 1961.

During fiscal year 1961 there were 121 contracts executed for the le of power, transmission service or for other purposes. In addition to these contracts and in order to institute the Eastern Division f the Missouri River Basin project supplemental power service program and various net billing procedures, 91 letter agreements were lso executed.

Included in the 121 contracts were various types as follows:

| *o. of contracts* | *Types of customers* |
|---|---|
| 15 | Private utilities |
| 26 | REA cooperatives |
| 42 | Municipalities |
| 13 | Federal agencies |
| 7 | State agencies |
| 6 | Irrigation districts |
| 12 | Non-REA cooperatives |
| 121 | |

A number of these executed contracts were renewals of current ontracts to place the full allocation of power under contract or to ncorporate the supplemental power service program.

The Bureau has continued its policy of contracting for wheeling ower and energy beyond delivery points over existing facilities and as entered into several mutual interchange agreements with its ustomers to augment the supplemental power service program.

At the end of the fiscal year the Bureau had 61 contracts and 0 supplements or amendments under active negotiation with 45 municipalities, 20 REA cooperatives, 14 State agencies, 3 Federal gencies, 15 private utilities and 4 irrigation districts. A number of these are also to renew existing contracts or to revise current ontracts to incorporate the supplemental power service program or o place the full allocation of power under contract.

The approved allocations for the Central Valley project, the eastern livision of the Missouri River Basin and the pending reallocation of he Parker-Davis project and the renegotiation of the output of the Falcon Dam, all will require the preparation of new contracts or supplements to existing contracts with the allottees.

## *Financing Reclamation Projects*

Appropriations made available to the Bureau of Reclamation for ll purposes in fiscal year 1961 totaled $281,663,705. This amount ncludes $1,385,000 appropriated in two supplemental acts, most of which was provided to cover pay raise costs. Permanent appropriations are not included. Appropriations for 1961 exceed those for 1960 by $25.4 millions.

With an unobligated balance of $39.7 million carried over from fiscal year 1960 for construction, investigations and the Loan Program plus funds advanced by water users, trust funds, the continuing fund for emergency expenses of Fort Peck project and new appropriations the total amount available to Reclamation was $329 millions. Of this amount there remained unobligated at the close of 1961 for use in fiscal year 1962 funds in the amount of $31.8 millions.

Funds appropriated, by activity, for fiscal year 1961, together with the amounts to be derived from the special and general funds are shown in the following condensed statement:

*Condensed Statement of Appropriations, fiscal year 1961 (Exclusive of trust funds and permanent appropriations)*

| | | |
|---|---|---|
| General investigations | | $5, 148, 000 |
| Reclamation fund | $3, 943, 000 | |
| Colorado River development fund | 500, 000 | |
| General fund | 705, 000 | |
| Construction and rehabilitation | | 166, 744, 880 |
| Reclamation fund | 90, 000, 000 | |
| General fund | 76, 744, 880 | |
| Upper Colorado River Basin fund | | 58, 700, 000 |
| General fund | 61, 400, 000 | |
| Transferred to: | | |
| Operation and maintenance | −2, 200, 000 | |
| Emergency fund | −500, 000 | |
| Operation and maintenance | | 34, 191, 000 |
| Reclamation fund | 26, 496, 000 | |
| Colorado River Dam fund | 1, 335, 000 | |
| General fund | 4, 160, 000 | |
| Transferred from Upper Colorado River Basin fund | 2, 200, 000 | |
| Loan program | | 11, 642, 825 |
| General fund | 11, 642, 825 | |
| Emergency fund | | 500, 000 |
| Transferred from Upper Colorado River Basin fund | 500, 000 | |
| General administrative expenses | | 4, 572, 000 |
| Reclamation fund | 4, 290, 000 | |
| General fund | 282, 000 | |
| Boulder City municipal fund, Lake View construction | | 150, 000 |
| Proceeds from disposal of property | 150, 000 | |
| Disposal of Coulee Dam community | | 15, 000 |
| Proceeds from sale of property | 15, 000 | |
| Grand total | 281, 663, 705 | 281, 663, 705 |

*Condensed Statement of Appropriations, fiscal year 1961 (Exclusive of trust funds and permanent appropriations)*—Continued

| | |
|---|---|
| Reclamation fund | $124, 729, 000 |
| Colorado River Dam fund | 1, 335, 000 |
| Colorado River development fund | 500, 000 |
| General fund | 154, 934, 705 |
| Boulder City Municipal fund | 150, 000 |
| Coulee Dam community | 15, 000 |
| | 281, 663, 705 |

## *Repayment of Project Costs by Water Users*

Contractual arrangements with irrigation districts, municipalities, industries and various other water user organizations consist of various forms and are written under a complex of laws dating back to the establishment of the Reclamation Service in 1902. The repayment program is constantly developing as the Congress recognizes new means of providing vitality to the multiple-purpose functions of the Nation's water resources development and accordingly enacts legislation to enable greater financial participation by an increasing number of beneficiaries. This progress has encouraged forward-looking State legislatures to keep pace by setting up Conservancy District and similar statutes—North Dakota, for example, has established the Garrison Diversion Conservancy District covering 25 counties—with ad valorem taxing capabilities which will greatly enhance irrigation repayment.

The dollar-value of all existing repayment contracts on June 30, 1961, was $1,101,193,113. Of these outstanding water user obligations, there had been returned to the United States, on that date, in the amount of $166,156,249 with practically no delinquencies. Water service contracts now in force will provide collections from water users for quantities to be received on a long-term basis in the form of additional repayment revenues in the amount of $895 million.

During fiscal year 1961, 47 contracts were executed; 13 more (the 28 contractors of the Kings River project are counted as 1) were approved by the Department and are in the process of being executed by irrigation districts or other repayment entities concerned. Some of these contracts involve sizable sums of money and represent the means, otherwise unlikely of attainment, for appreciable numbers of people to reach a higher standard of living.

# *Foreign Activities*

## *Technical Assistance for Newly Developing Countries*

Under the agreement with the International Cooperation Administration entered into late in fiscal year 1961, the Bureau of Reclamation's team in Afghanistan, assisting the Helmand Valley Authority of the Government of Afghanistan, was expanded and advisory services were initiated. Technical advice and on-the-job training were instrumental in improving the operation and maintenance of the existing irrigation works and in reactivating construction and procurement activities of the Afghan Construction Unit. Land classification and drainage studies were started.

The previously established project engaged in the reconnaissance of the Blue Nile River Basin in Ethiopia, also a part of the ICA program, continued to gain momentum during the year. Extensive geologic, land-classification, and hydrologic investigations and land-use studies were continued, as was the program of training Ethiopian engineers and technicians in investigating and planning the development of water resources.

Laboratory studies being made to evaluate foundation conditions and construction materials for the Shihmen Dam, Formosa, and construction advisory services furnished at Wu Sheh Dam, Formosa, were completed. Design assistance to the Snowy Mountains Hydro-Electric Authority, Australia, was continued. The work for Australia was accomplished under the terms of Public Law 402, 80th Congress, and cost of the work was borne by the Snowy Mountains Authority.

In addition to the project-type assistance, Reclamation personnel were in great demand for short-term details to various parts of the world. The detailing of these Bureau specialists to assist foreign countries involved visits by 18 individuals to 13 countries where advice and assistance were provided on design, construction, operation and maintenance, organization and management, farm settlement, agricultural economics, drainage, and project planning. These activities were undertaken at the request of the International Cooperation Administration, the United Nations, The International Bank for Reconstruction and Development, or the government of the foreign country involved through the International Educational Exchange Service of the Department of State. Funds to cover all costs of such details are provided by the agency requesting the services. In addition to this technical aid to foreign countries, the Bureau cooperated with the Office of Saline Water in detailing a specialist to Japan and Israel for water demineralization studies.

Other continuing activities in support of the U.S. Government's oreign-aid program consisted of providing on-the-job training and bservation programs for foreign engineers and technicians at Bureau f Reclamation facilities in the United States; detailing reclamation pecialists for short visits to various countries to assist with specific roblems; and furnishing Bureau publications and other technical naterial to agencies of foreign governments.

Training and observation programs ranging from a few days to year or more in duration were implemented for 356 individuals rom 34 countries. Arrangements were completed for three Ethiopian ngineers graduating from American colleges to receive in-service raining in water resources development prior to returning home to vork with Bureau personnel on the Blue Nile River reconnaissance roject, Ethiopia. Actions were initiated to implement combined ong-term academic and in-service training programs in the United States for a selected group of employees of the Helmand Valley Authority of Afghanistan. The training will prepare the participants for responsible positions with the Authority.

## *Legal Activities*

Contract negotiations were conducted between the Bureau and the city of Englewood, Colo., leading to preparation of a draft of proposed contract under which the United States would accept on the West Slope water which the city is entitled to divert, and would release to the city from the facilities of the C Big T project on the East Slope an equivalent amount of water less carriage losses. The city would pay appropriate charges for the service, and the United States would retain all additional revenues derived from passage of the water through power generation facilities.

Institution of a program involving closer scrutiny of all incidents of equipment and material failure to determine existence of possible facts indicating manufacturers' liability for breach of implied warranty of fitness for intended use or for latent defects in design or condition not barred by limitations against claims for defects in materials and workmanship stated in contract clauses. The program has already had beneficial effects.

# *Statistical Summary*

TABLE 1.—Major Bureau of Reclamation contracts awarded in fisca year 1961
TABLE 2.—Principal features completed on Bureau of Reclamatio projects
TABLE 3.—Bureau of Reclamation construction indexes
TABLE 4.—Power sales and revenues by projects
TABLE 5.—Hydroelectric powerplants
TABLE 6.—Classification of power customers
TABLE 7.—Acreage, production, and gross crop value by crops an types of crops
TABLE 8.—Irrigation and gross crop value data, by projects, for eac State
TABLE 9—Accretions to Reclamation Fund by States
TABLE 10.—The Reclamation Fund, funds available for appropria tion, fiscal years 1960–61

TABLE 1.—*Major Bureau of Reclamation contracts awarded in fiscal year 1961*

| Feature | Project | Amount of award |
|---|---|---|
| Yellowtail Dam and powerplant | Missouri River Basin | $39,809,359 |
| Eight 125,000-kva generators for Glen Canyon powerplant | Colorado River storage | 8,007,798 |
| Fontenelle Dam | Seedskadee | 7,917,170 |
| Whiskeytown Dam, Trinity River division | Central Valley | 6,215,577 |
| Lemon Dam and County Road relocation | Florida | 5,820,807 |
| pring Creek powerplant, Trinity River division | Central Valley | 4,126,456 |
| 13 miles of Sioux City-Spencer and Sioux City-Denison-Creston 161-kv transmission lines. | Missouri River Basin | 3,335,243 |
| Spring Creek Debris Dam, Trinity River division | Central Valley | 3,196,387 |
| Stringing conductor for second circuit additions to Fort Thompson-Huron-Watertown, Fort Randall-Sioux City, and Fort Randall-Fort Thompson 230-kv transmission lines. | Missouri River Basin | 3,096,520 |
| Merritt Dam, Ainsworth unit | do | 2,655,044 |
| Lewiston Dam, Trinity River division | Central Valley | 2,410,542 |
| Farwell Main Canal and Central Canal, Farwell unit | Missouri River Basin | 1,935,855 |
| Crawford Dam | Smith Fork | 1,930,779 |
| Constructing foundations and furnishings and erecting steel towers for 136 miles of Garrison-Jamestown 230-kv transmission line. | Missouri River Basin | 1,913,500 |
| Sherman Feeder Canal, Farwell unit | do | 1,818,343 |
| 15 miles of Rangely-Oak Creek and 10 miles of Kremmling-Green Mountain 115-kv transmission lines and 8.3 miles of Kremmling-Gore Tap 69-kv transmission line. | Colorado River storage | 1,809,720 |
| 14 miles of Garrison-Minot-Rugby 115-kv transmission line | Missouri River Basin | 1,806,171 |
| Sherman Feeder Canal and Tunnel, Farwell unit | do | 1,682,722 |
| Two 74,444-kva generators for Clear Creek powerplant, Trinity River division. | Central Valley | 1,581,284 |
| Two 83,333-kva generators for Spring Creek powerplant, Trinity River division. | do | 1,491,400 |
| Main Canal, Station 0+00 to 838+59 | San Angelo | 1,487,494 |
| Three 40,000-kva generators for Flaming Gorge powerplant | Colorado River storage | 1,477,516 |
| Two 55,555-kva generators for Trinity powerplant, Trinity River division. | Central Valley | 1,428,445 |
| Laterals 1 through 10, and sublaterals for East unit, Greater Wenatchee division. | Chief Joseph Dam | 1,398,236 |
| Relocation of Union Pacific Railroad for East Bench unit, Three Forks division. | Missouri River Basin | 1,395,336 |
| 110.5 miles of Jamestown-Grand Forks 115-kv. Transmission Line No. 1. | do | 1,352,207 |
| Steinaker Service Canal | Central Utah | 1,327,584 |
| El Dorado main and reservoir, American River division | Central Valley | 1,327,490 |
| 85.2 miles of Flaming Gorge-Vernal-Rangely 138-kv Transmission line. | Colorado River storage | 1,279,899 |
| Pipelines and laterals for Corral Irrigation District, Friant-Kern division. | Central Valley | 1,189,092 |
| Stringing conductors and overhead ground wires for 58 miles of Oahe-Fort Thompson 230-kv transmission line, 230-kv Oahe switchyard approaches, and 1.42 miles of 115-kv Oahe-Midland transmission line. | Missouri River Basin | 1,166,473 |
| Two 105,000-hp hydraulic turbines for Spring Creek powerplant, Trinity River division. | Central Valley | 1,125,000 |
| River and booster pumping plants | Chief Joseph Dam | 1,104,087 |
| Arcadia Diversion Dam and Sherman Feeder Canal, Farwell unit. | Missouri River Basin | 1,093,548 |
| Main Canal and laterals, gravity extension, East and West highline laterals—unit 2B—Davis aqueduct. | Weber Basin | 1,082,033 |
| Stringing conductors and overhead ground wires for Bismarck-Jamestown 230-kv Transmission Line No. 2. | Missouri River Basin | 1,001,450 |

[illegible] *features completed on Bureau of Reclamation projects i fiscal year 1961*

| Feature | Project | State |
|---|---|---|
| Royal Branch laterals, Block 83 | Columbia Basin | Washington. |
| Wahluke Branch laterals, Block 20, including White Bluffs pumping plant No. 2 and WB10A3 pumping plant. | do | Do. |
| West Canal laterals, Block 88 | do | Do. |
| Prineville Dam | Crooked River | Oregon. |
| Relocation Oregon State Highway 27 | do | Do. |
| Crooked River Diversion Canal and headworks | do | Do. |
| Distribution Canal | do | Do. |
| Enlargement of Emigrant Dam | Rogue River Basin | Do. |
| South Fork, Daley Creek and Grizzly Creek collection canal system and 3 diversion dams. | do | Do. |
| Major structures for East lateral rehabilitation | do | Do. |
| Ashland lateral rehabilitation | do | Do. |
| Rehabilitation Oak Street Diversion Dam and 1st section Talent lateral. | do | Do. |
| Rehabilitation of 2d section Talent lateral | Rogue River Basin | Do. |
| Teapot Dome Water District distribution system | Central Valley | California. |
| Corning Canal pumping plant | do | Do. |
| Trinity road relocation, Rush Creek to Stoney Creek | do | Do. |
| Trinity road relocation, Stoney Creek to Ridgeville | do | Do. |
| Trinity road relocation, Ridgeville to Covington Mill | do | Do. |
| Trinity road relocation, Cedar Creek to Nelson Creek Gap. | do | Do. |
| Canals, laterals, and drains, Sump No. 2, contract unit 1. | Klamath | Oregon. |
| Canals, lateral, and drain, Sump No. 2, contract unit 2. | do | Do. |
| Pumping plants W, X, and Y | do | Do. |
| Wellton-Mohawk main conveyance channel, 1st section. | Gila | Arizona. |
| Wellton-Mohawk main conveyance channel, 2d section. | do | Do. |
| Wellton-Mohawk main conveyance channel, 3d section. | do | Do. |
| Steinaker Dam | Central Utah | Utah. |
| Fort Thornburgh Diversion Dam Steinaker feeder canal, and Rock Point canal extension. | do | Do. |
| Southside Canal, 1st section | Collbran | Colorado. |
| Southside Canal, 2d section | do | Do. |
| Leon Creek and Park Creek Diversion Dams and feeder canal. | do | Do. |
| Clearing of 1st phase of Flaming Gorge Reservoir | Colorado River storage | Utah. |
| Hammond main canal, 1st section | Hammond | New Mexico. |
| Ricks Creek laterals for Davis Aqueduct lateral system | Weber Basin | Utah. |
| Installing natural gas engines in pumping plants | Lower Rio Grande Rehabilitation. | New Mexico. |
| Rehabilitation of H lateral | do | Do. |
| Rehabilitation of C and G lateral system | do | Do. |
| Rehabilitation of K lateral system | do | Do. |
| Channelization of Rio Grande, Belen area, unit 4 | Middle Rio Grande | Do. |
| Channelization of Rio Grande, Belen area, unit 2 | do | Do. |
| Foss Dam | Washita Basin | Oklahoma. |
| Anadarko aqueduct | do | Do. |
| Dawson County substation | Fort Peck | Montana. |
| Anchor Dam | Missouri River Basin | Wyoming. |
| Foundations and steel towers for Fort Peck-Dawson County-Bismarck 230-kv transmission line, 310 miles. | do | North Dakota. |
| Stages 03 and 04 additions to Fargo substation | do | Do. |
| Foundations and towers for Bismarck-Jamestown 230-kv Transmission Line No. 2, 100 miles. | do | Do. |
| Stringing conductor and OHG wire for 310 miles, Fort Peck-Dawson County-Bismarck 230-kv transmission line. | Fort Peck and Missouri River. | Montana, North Dakota. |
| Stringing conductor and OHG wire for 100 miles of Bismarck-Jamestown 230-kv Transmission Line No. 2. | Missouri River Basin | North Dakota. |
| White Rock extension canal, final section | do | Kansas. |
| Pump No. 1 canal and Pump No. 1 south canal and lateral system. | do | Do. |
| Culbertson Canal, 2d section | do | Nebraska. |
| Culbertson extension canal, 1st section | do | Do. |
| Generators for Fremont Canyon powerplant | do | Wyoming. |
| Completion of Fremont Canyon powerplant | do | Do. |
| Gray Reef Dam | do | Do. |
| Osborne Canal, 4th section | do | Kansas. |
| Kortes-Cheyenne 115-kv transmission line | do | Wyoming. |

TABLE 3.—*Bureau of Reclamation construction indexes, fiscal year 1961 (for application to field costs only)*

| Cost indexes based on January 1940 costs=$1.00 | July 1960 | January 1961 | June 1961 |
|---|---|---|---|
| Dams: | | | |
| Earth | 2.14 | 2.18 | 2.18 |
| Dam structure | 1.82 | 1.86 | 1.86 |
| Spillway | 2.41 | 2.43 | 2.43 |
| Outlet works | 2.71 | 2.73 | 2.73 |
| Concrete | 2.36 | 2.36 | 2.36 |
| Diversion | 2.67 | 2.67 | 2.67 |
| Pumping plants: | | | |
| Building and equipment | 3.01 | 2.97 | 2.93 |
| Structures and improvements [1] | 3.03 | 2.98 | 2.98 |
| Equipment | 3.10 | 3.02 | 2.99 |
| Pumps and prime movers | 3.22 | 3.13 | 3.06 |
| Accessory electric and miscellaneous equipment | 2.90 | 2.88 | 2.88 |
| Steel penstocks and discharge pipes | 3.88 | 3.88 | 3.88 |
| Canals and conduits: | | | |
| Canals | 2.40 | 2.40 | 2.38 |
| Canal earthwork | 1.45 | 1.47 | 1.44 |
| Canal structures | 3.26 | 3.26 | 3.23 |
| Conduits (tunnels, free-flow, concrete-lined) | 2.85 | 2.87 | 2.87 |
| Laterals and drains | 3.10 | 3.17 | 3.17 |
| Lateral earthwork | 1.46 | 1.47 | 1.46 |
| Lateral structures | 3.85 | 3.96 | 3.96 |
| Powerplants, hydro: | | | |
| Building and equipment | 2.97 | 2.97 | 2.95 |
| Structures and improvements [1] | 2.99 | 2.96 | 2.96 |
| Equipment | 2.98 | 2.96 | 2.93 |
| Turbines and generators | 2.97 | 2.97 | 2.93 |
| Accessory electric equipment | 2.87 | 2.76 | 2.72 |
| Miscellaneous equipment | 2.92 | 2.92 | 2.92 |
| Concrete pipelines | 2.49 | 2.49 | 2.49 |
| Switchyards and substations | 3.05 | 2.92 | 2.92 |
| Transmission lines: | | | |
| Wood-pole 115-kv | 2.59 | 2.57 | 2.57 |
| Poles and fixtures | 2.51 | 2.44 | 2.46 |
| Overhead conductors and devices | 2.63 | 2.65 | 2.65 |
| Steel-tower, 230-kv | 2.83 | 2.83 | 2.83 |
| General property (buildings) | 3.19 | 3.16 | 3.16 |
| Roads and bridges: | | | |
| Primary roads | 2.60 | 2.58 | 2.58 |
| Secondary roads (unsurfaced) | 2.30 | 2.37 | 2.37 |
| Bridges (steel) | 3.23 | 3.25 | 3.25 |
| Composite index (indicates general cost trend) | 2.65 | 2.67 | 2.67 |

[1] Indexes for structures and improvements on pumping plants and powerplants are based on a reinforced oncrete structure.

TABLE 4.—*Bureau of Reclamation power systems, power sales, and revenues by projects, fiscal year ending June 30, 1961*

| Projects | Sales of electric energy, kilowatt-hours [1] | Revenues from sales [1] |
|---|---|---|
| Boulder Canyon | 3,636,417,739 | $9,196,317.35 |
| Central Valley | 2,918,544,536 | 11,593,152.46 |
| Columbia Basin [2] | 12,422,201,720 | 13,141,353.50 |
| Eklutna | 173,339,836 | 1,759,291.07 |
| Falcon | 84,629,900 | 357,019.42 |
| Fort Peck | 63,956,057 | 271,137.57 |
| Hungry Horse [2] | 835,863,000 | 3,840,225.99 |
| Minidoka Units 1 through 6 | 203,558,160 | 1,031,974.43 |
| Missouri River Basin: | | |
| Eastern Division | 3,650,973,144 | 14,717,531.60 |
| Western Division [3] | 1,480,682,548 | 9,278,922.96 |
| Palisades, Boise, and Minidoka Unit 7 | 529,872,105 | 1,735,217.35 |
| Parker-Davis | 1,210,155,720 | 4,861,949.67 |
| Provo River | 11,534,160 | 34,793.40 |
| Rio Grande | 51,471,958 | 298,027.46 |
| Rogue River Basin | 49,514,000 | 301,474.43 |
| Weber Basin | 11,228,400 | 33,915.01 |
| Yakima [2] | 133,512,912 | 424,890.60 |
| Yuma | 9,709,467 | 28,855.06 |
| Grand total | 27,477,165,362 | 72,906,049.33 |

[1] Does not include energy sales and revenues in transactions between Bureau projects. Includes Rogue River project test period sales; 31,091,600 kilowatt-hours and $162,702.36.

[2] Deliveries to and revenues from Bonneville Power Administration included as follows:

| | | |
|---|---|---|
| Columbia Basin | 11,739,494,736 | $12,800,000 |
| Hungry Horse | 833,148,000 | 3,833,000 |
| Yakima | 104,577,465 | 345,000 |
| Total | 12,677,220,201 | 16,978,000 |

[3] Includes systems of Riverton, Shoshone, Colorado-Big Thompson, Kendrick, and North Platte projects.

TABLE 5.—*Hydroelectric powerplants*

| State | Project | Name of plant | Calendar year of initial operation | Nameplate rating | | Number and nameplate rating of generators | |
|---|---|---|---|---|---|---|---|
| | | | | Existing (kilowatts) | Ultimate (kilowatts) | Existing (kilowatts) | Ultimate (kilowatts) |
| A. CONSTRUCTED AND OPERATED BY BUREAU OF RECLAMATION | | | | | | | |
| 1. Alaska | Eklutna | Eklutna | 1955 | 30, 000 | 30, 000 | 2-15,000 | 2-15,000 |
| 2. Arizona-Nevada | Boulder Canyon | Hoover [1] | 1936 | 1, 249, 800 | 1, 344, 800 | 14-82,500; 1-40,000; 2-2,400; 1-50,000 | 14-82,500; 1-40,000; 2-2,400; 1-50,000; 1-95,000 |
| 3. Arizona-Nevada | Parker-Davis | Davis | 1951 | 225, 000 | 225, 000 | 5-45,000 | 5-45,000 |
| 4. Arizona-California | do | Parker | 1942 | 120, 000 | 120, 000 | 4-30,000 | 4-30,000 |
| 5. California | Central Valley | Folsom | 1955 | 162, 000 | 162, 000 | 3-54,000 | 3-54,000 |
| 6. California | do | Keswick | 1949 | 75, 000 | 75, 000 | 3-25,000 | 3-25,000 |
| 7. California | do | Nimbus | 1955 | 13, 500 | 13, 500 | 2-6,750 | 2-6,750 |
| 8. California | do | Shasta | 1944 | 379, 000 | 379, 000 | 5-75,000; 2-2,000 | 5-75,000; 2-2,000 |
| 9. California | Yuma | Siphon Drop | 1926 | 1, 600 | 1, 600 | 2-800 | 2-800 |
| 10. Colorado | Colorado-Big Thompson | Big Thompson | 1959 | 4, 500 | 4, 500 | 1-4,500 | 1-4,500 |
| 11. Colorado | do | Estes | 1950 | 45, 000 | 45, 000 | 3-15,000 | 3-15,000 |
| 12. Colorado | do | Flatiron | 1954 | 71, 500 | 71, 500 | 2-31,500; 1-8,500 | 2-31,500; 1-8,500 |
| 13. Colorado | do | Green Mountain | 1943 | 21, 600 | 21, 600 | 2-10,800 | 2-10,800 |
| 14. Colorado | do | Marys Lake | 1951 | 8, 100 | 8, 100 | 1-8,100 | 1-8,100 |
| 15. Colorado | do | Pole Hill | 1954 | 33, 250 | 33, 250 | 1-33,250 | 1-33,250 |
| 16. Colorado | Grand Valley | Grand Valley [2] | 1932 | 3, 000 | 3, 000 | 2-1,500 | 2-1,500 |
| 17. Idaho | Boise | Anderson Ranch | 1950 | 27, 000 | 40, 500 | 2-13,500 | 3-13,500 |
| 18. Idaho | do | Black Canyon | 1925 | 8, 000 | 8, 000 | 2-4,000 | 2-4,000 |
| 19. Idaho | do | Boise Diversion | 1912 | 1, 500 | 1, 500 | 3-500 | 3-500 |
| 20. Idaho | Minidoka | Minidoka | 1909 | 13, 400 | 13, 400 | 1-5,000; 1-2,400; 5-1,200 | 1-5,000; 1-2,400; 5-1,200 |
| 21. Idaho | Palisades | Palisades | 1957 | 114, 000 | 114, 000 | 4-28,500 | 4-28,500 |
| 22. Montana | Missouri River Basin | Canyon Ferry | 1953 | 50, 000 | 50, 000 | 3-16,667 | 3-16,667 |
| 23. Montana | Hungry Horse | Hungry Horse | 1952 | 285, 000 | 285, 000 | 4-71,250 | 4-71,250 |
| 24. New Mexico | Rio Grande | Elephant Butte | 1940 | 24, 300 | 24, 300 | 3-8,100 | 3-8,100 |
| 25. Oregon | Rogue River Basin | Green Springs | 1960 | 16, 000 | 16, 000 | 1-16,000 | 1-16,000 |
| 26. South Dakota | Missouri River Basin | Angostura | 1951 | 1, 200 | 1, 200 | 1-1,200 | 1-1,200 |
| 27. Utah | Provo River | Deer Creek | 1958 | 4, 950 | 4, 950 | 2-2,475 | 2-2,475 |
| 28. Utah | Weber Basin | Gateway | 1958 | 4, 275 | 4, 275 | 2-2,137.5 | 2-2,137.5 |
| 29. Utah | do | Wanship | 1958 | 1, 425 | 1, 425 | 1-1,425 | 1-1,425 |
| 30. Washington | Columbia Basin | Grand Coulee | 1941 | 1, 974, 000 | 1, 974, 000 | 18-108,000; 3-10,000 | 18-108,000; 3-10,000 |
| 31. Washington | Yakima | Chandler | 1956 | 12, 000 | 12, 000 | 2-6,000 | 2-6,000 |
| 32. Washington | do | Roza | 1958 | 11, 250 | 11, 250 | 1-11,250 | 1-11,250 |
| 33. Wyoming | Missouri River Basin | Fremont Canyon | 1960 | 48, 000 | 48, 000 | 2-24,000 | 2-24,000 |
| 34. Wyoming | Kendrick | Alcova | 1955 | 36, 000 | 36, 000 | 2-18,000 | 2-18,000 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 35. Wyoming | do | Seminoe | 1939 | 32, 400 | 32, 400 | 3-10,800 | 3-10,800 |
| 36. Wyoming | Missouri River Basin | Boysen | 1952 | 15, 000 | 15, 000 | 2-7,500 | 2-7,500 |
| 37. Wyoming | do | Glendo | 1958 | 24, 000 | 24, 000 | 2-12,000 | 2-12,000 |
| 38. Wyoming | do | Kortes | 1950 | 36, 000 | 36, 000 | 3-12,000 | 3-12,000 |
| 39. Wyoming | North Platte | Guernsey | 1927 | 4, 800 | 4, 800 | 2-2,400 | 2-2,400 |
| 40. Wyoming | Riverton | Pilot Butte | 1925 | 1, 600 | 1, 600 | 2-800 | 2-800 |
| 41. Wyoming | Shoshone | Heart Mountain | 1948 | 5, 000 | 5, 000 | 1-5,000 | 1-5,000 |
| 42. Wyoming | do | Shoshone | 1922 | 5, 600 | 5, 600 | 1-4,000; 2-800 | 1-4,000; 2-800 |
| Subtotal A | | | | 5, 199, 550 | 5, 308, 050 | | |

## B. CONSTRUCTED AND OPERATED BY OTHERS—POWER MARKETED BY U.S.B.R.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. Montana | Missouri River Basin (USCE) | Fort Peck | 1943 | 165, 000 | 165, 000 | 2-35,000; 1-15,000; 2-40,000. | 2-35,000; 2-40,000; 1-15,000. |
| 2. North Dakota | do | Garrison | 1956 | 400, 000 | 400, 000 | 5-80,000 | 5-80,000 |
| 3. South Dakota | do | Fort Randall | 1954 | 320, 000 | 320, 000 | 8-40,000 | 8-40,000 |
| 4. South Dakota | do | Gavins Point | 1956 | 100, 035 | 100, 035 | 3-33,345 | 3-33,345 |
| 5. Texas | Falcon (IBWC) | Falcon | 1954 | 31, 500 | 42, 000 | 3-10,500 | 4-10,500 |
| Subtotal B | | | | 1, 016, 535 | 1, 027, 035 | | |

## C. UNDER CONSTRUCTION BY BUREAU OF RECLAMATION

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. Arizona | Colorado River Storage | Glen Canyon | 1964 | 0 | 900, 000 | 0 | 8-112,500 |
| 2. California | Central Valley | Clear Creek | 1963 | 0 | 134, 000 | 0 | 2-67,000 |
| 3. California | do | Lewiston | 1962 | 0 | 350 | 0 | 1-350 |
| 4. California | do | Spring Creek | 1963 | 0 | 150, 000 | 0 | 2-75,000 |
| 5. California | do | Trinity | 1963 | 0 | 100, 000 | 0 | 2-50,000 |
| 6. Colorado | Collbran | Upper Molina | 1961 | 0 | 8, 640 | 0 | 1-8,640 |
| 7. Colorado | do | Lower Molina | 1961 | 0 | 4, 860 | 0 | 1-4,860 |
| 8. Montana | Missouri River Basin | Yellowtail | 1966 | 0 | 200, 000 | 0 | 4-50,000 |
| 9. Utah | Colorado River Storage | Flaming Gorge | 1963 | 0 | 108, 000 | 0 | 3-36,000 |
| Subtotal C | | | | 0 | 1, 605, 850 | | |

## D. UNDER CONSTRUCTION BY OTHERS—POWER TO BE MARKETED BY U.S.B.R.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. South Dakota | Missouri River Basin (USCE) | Big Bend | 1964 | 0 | 468, 000 | 0 | 8-58,500 |
| 2. South Dakota | do | Oahe | 1962 | 0 | 595, 000 | 0 | 7-85,000 |
| Subtotal D | | | | 0 | 1, 063, 000 | | |

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[1] Powerplant units operated by Southern Edison Co. and City of Los Angeles Department of Water and Power as agents of the United States.

[2] Leased to Public Service Co. of Colorado for operation.

TABLE [illegible].—*Summary by classification of customers for 12 months ending June 30, 1961* [1]

| | Number of customers | Sales of electric energy kilowatt-hours | Revenues from sales |
|---|---|---|---|
| Privately owned utilities | 31 | 2, 037, 859, 771 | $7, 574, 999. 8 |
| Municipal utilities | 119 | 2, 025, 171, 188 | 9, 258, 453. 7 |
| State-owned utilities | 14 | 4, 363, 032, 866 | 15, 680, 476. 1 |
| Cooperative utilities (Rural Electrification Administration projects) | 53 | 2, 870, 839, 822 | 14, 603, 974. 3 |
| Other Federal utilities [2] | 6 | 12, 756, 286, 642 | 17, 321, 857. 7 |
| Residential and domestic | 302 | 6, 200, 246 | 32, 123. 8 |
| Rural (other than Rural Electrification Administration projects) | 7 | 193, 930 | 1, 222. 6 |
| Commercial and industrial | 19 | 97, 439, 581 | 490, 708. 2 |
| Public authorities | 86 | 2, 231, 460, 170 | 6, 577, 623. 1 |
| Interdepartmental | 45 | 1, 088, 681, 146 | 1, 364, 609. 6 |
| Total all customers | 682 | 27, 477, 165, 362 | 72, 906, 049. 3 |

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[1] Does not include energy sales and revenues in transactions between Bureau projects.

[2] Totals include 12,677,220,201 kilowatt-hours delivered to Bonneville Power Administration for marketing and $16,978,000 in payments by that agency.

TABLE 7.—*Acreage, production, and gross crop value by crops and types of crops—1960*

| Crops | Irrigated lands | | Tonnage | | Gross crop value | |
|---|---|---|---|---|---|---|
| | Total | Percent of total | Total | Percent of total | Total | Percent of total [1] |
| Cereals: | *Acres* | | | | | |
| Barley | 527,497 | 7.65 | 731,323 | 2.205 | $30,173,497 | 2.61 |
| Corn | 367,277 | 5.32 | 785,020 | 2.367 | 30,923,101 | 2.67 |
| Oats | 185,470 | 2.69 | 165,303 | .499 | 7,491,621 | .65 |
| Rice | 6,405 | .09 | 11,591 | .035 | 975,020 | .08 |
| Rye | 2,024 | .03 | 1,640 | .005 | 66,739 | .01 |
| Sorghums (sorgo, kaffir, etc.) | 107,970 | 1.56 | 164,933 | .497 | 6,900,651 | .60 |
| Wheat | 418,589 | 6.07 | 631,128 | 1.903 | 34,457,533 | 2.98 |
| Other cereals | 84,331 | 1.22 | 133,883 | .404 | 5,743,132 | .49 |
| Total cereals | 1,699,563 | 24.63 | 2,624,821 | 7.915 | 116,731,294 | 10.09 |
| Forage: | | | | | | |
| Alfalfa hay | 1,715,703 | 24.87 | 6,627,093 | 19.984 | 154,556,403 | 13.35 |
| Other hay | 189,026 | 2.74 | 356,497 | 1.075 | 7,143,874 | .62 |
| Irrigated pasture | 1,005,077 | 14.57 | 2,595,059 | 7.825 | 32,873,189 | 2.84 |
| Corn fodder | 9,989 | .14 | 63,856 | .192 | 509,314 | .04 |
| Silage or ensilage | 216,320 | 3.14 | 3,563,790 | 10.747 | 23,526,705 | 2.03 |
| Crop residue: Beet tops | -------- | -------- | 1,742,253 | 5.254 | 1,305,458 | .11 |
| Stubble, stalks, etc | -------- | -------- | 156,025 | .470 | 1,359,223 | .12 |
| Straw (all kinds) | -------- | -------- | 220,144 | .664 | 1,990,755 | .17 |
| Root crops (carrots, etc.) | 157 | -------- | 1,201 | .004 | 10,750 | -------- |
| Other forage | 43,669 | .63 | 73,519 | .222 | 625,299 | .06 |
| Total forage | 3,179,941 | 46.09 | 15,399,437 | 46.437 | 223,900,970 | 19.34 |
| Miscellaneous field crops: | | | | | | |
| Beans, castor | 631 | .01 | 490 | .002 | 56,294 | .01 |
| Beans, dry and edible | 362,871 | 5.26 | 295,851 | .892 | 41,929,892 | 3.62 |
| Broomcorn | 2,351 | .03 | 397 | .001 | 127,376 | .01 |
| Cotton, lint (Upland) | 502,301 | 7.28 | 243,616 | .735 | 153,472,134 | 13.26 |
| Cotton, seed (Upland) | -------- | -------- | 405,016 | 1.221 | 20,047,145 | 1.73 |
| Cotton, lint (American-Egyptian) | 31,317 | .45 | 8,734 | .026 | 9,187,469 | .79 |
| Cotton, seed (American-Egyptian) | -------- | -------- | 15,945 | .048 | 791,428 | .07 |
| Hops | 17,577 | .26 | 17,218 | .052 | 12,062,500 | 1.04 |
| Peppermint | 14,675 | .21 | 568 | .002 | 4,111,946 | .36 |
| Spearmint | 9,107 | .13 | 362 | .001 | 2,643,799 | .23 |
| Sugar beets | 394,552 | 5.72 | 7,348,754 | 22.160 | 78,214,902 | 6.76 |
| Other miscellaneous field crops | 3,071 | .05 | 4,568 | .014 | 400,651 | .03 |
| Total miscellaneous field crops | 1,338,453 | 19.40 | 8,341,519 | 25.154 | 323,045,536 | 27.91 |
| Vegetables: | | | | | | |
| Asparagus | 17,466 | .25 | 22,485 | .069 | 4,850,312 | .42 |
| Beans (processing) | 11,040 | .16 | 19,610 | .059 | 2,491,240 | .21 |
| Beans (fresh market) | 539 | .01 | 1,535 | .005 | 386,343 | .03 |
| Broccoli | 10,227 | .15 | 63,454 | .191 | 5,115,412 | .44 |
| Cabbage | 5.188 | .08 | 52,458 | .158 | 2,736,730 | .24 |
| Carrots | 12,733 | .18 | 136,362 | .411 | 8,638,420 | .75 |
| Cauliflower | 2,303 | .03 | 14,827 | .045 | 1,828,516 | .16 |
| Celery | 2,486 | .04 | 53,200 | .160 | 3,103,008 | .27 |
| Corn, sweet (processing) | 24,836 | .36 | 147,649 | .445 | 3,082,354 | .27 |
| Corn, sweet (fresh market) | 7,013 | .10 | 20,730 | .063 | 2,163,240 | .19 |
| Cucumbers | 2,033 | .03 | 20,283 | .061 | 2,490,151 | .21 |
| Greens (kale, etc.) | 71 | -------- | 121 | -------- | 16,954 | -------- |
| Lettuce | 66,214 | .96 | 423,381 | 1.277 | 44,402,903 | 3.83 |
| Melons: Cantaloupes, etc | 35,319 | .51 | 215,741 | .651 | 17,219,290 | 1.49 |
| Honey ball, honeydew, etc | 4,881 | .07 | 42,083 | .127 | 2,421,604 | .21 |
| Watermelons | 8,598 | .12 | 71,047 | .214 | 2,039,812 | .18 |
| Onions, dry | 15,508 | .23 | 256,436 | .773 | 9,932,496 | .86 |
| Onions, green | 77 | -------- | 734 | .002 | 72,905 | .01 |
| Peas, green (processing) | 10,918 | .16 | 19,392 | .059 | 1,522,655 | .13 |
| Peas, green (fresh market) | 380 | .01 | 689 | .002 | 128,753 | .01 |
| Peppers (all kinds) | 3,747 | .05 | 15,073 | .045 | 3,162,558 | .27 |
| Potatoes, early | 44,434 | .64 | 583,955 | 1.761 | 27,515,131 | 2.38 |
| Potatoes, late | 216,466 | 3.14 | 2,103,251 | 6.342 | 78,209,130 | 6.76 |
| Squash | 2,770 | .04 | 15,904 | .048 | 2,085,715 | .18 |
| Sweet potatoes | 383 | .01 | 1,657 | .005 | 177,379 | .01 |

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[1] Additional revenues are included in computing percentages.

TABLE 7.—*Acreage, production, and gross crop value by crops and types of crops—1960*—Continued

| Crops | Irrigated lands | | Tonnage | | Gross crop value | |
|---|---|---|---|---|---|---|
| | Total | Percent of total | Total | Percent of total | Total | Percent of total [1] |
| Vegetables—Continued | *Acres* | | | | | |
| Tomatoes (canning) | 16,028 | 0.23 | 250,941 | 0.757 | $6,182,190 | 0.53 |
| Tomatoes (fresh market) | 10,261 | .15 | 135,891 | .410 | 19,827,426 | 1.71 |
| Other vegetables | 7,090 | .10 | 37,567 | .113 | 4,626,612 | .40 |
| Total vegetables | 539,009 | 7.81 | 4,726,456 | 14.253 | 256,429,239 | 22.15 |
| Total nursery | 3,988 | .06 | | | 9,048,621 | .78 |
| Seeds: | | | | | | |
| Alfalfa | 77,795 | 1.13 | 16,144 | .049 | 8,359,686 | .72 |
| Clover (all kinds) | 27,726 | .40 | 6,100 | .018 | 2,559,185 | .22 |
| Corn | 10,133 | .15 | 12,284 | .037 | 1,389,315 | .12 |
| Flaxseed | 18,702 | .27 | 17,926 | .054 | 1,948,293 | .17 |
| Grass (all kinds) | 21,021 | .30 | 4,330 | .013 | 3,993,420 | .35 |
| Lettuce | 918 | .01 | 164 | | 238,150 | .02 |
| Onion | 910 | .01 | 278 | .001 | 467,469 | .04 |
| Pea | 32,313 | .47 | 34,654 | .105 | 2,649,113 | .23 |
| Potato (all kinds) | 1,086 | .02 | 8,775 | .027 | 662,536 | .06 |
| Sugar beet | 2,287 | .03 | 3,324 | .010 | 967.070 | .08 |
| Other seed | 13,747 | .20 | 7,370 | .022 | 1,674,371 | .14 |
| Total seeds | 206,638 | 2.99 | 111,349 | .336 | 24,908,608 | 2.15 |
| Fruits: | | | | | | |
| Apples | 44,534 | .65 | 283,485 | .855 | 26,442,957 | 2.28 |
| Apricots | 9,144 | .13 | 70,380 | .212 | 6,506,964 | .56 |
| Berries (all kinds) | 2,950 | .04 | 10,860 | .033 | 4,021,927 | .35 |
| Cherries | 6,048 | .09 | 10,758 | .032 | 3,531,713 | .30 |
| Citrus: Grapefruit | 16,198 | .24 | 129,284 | .390 | 6,026,930 | .52 |
| Lemons and limes | 12,518 | .18 | 128,156 | .386 | 5,977,014 | .52 |
| Oranges and tangerines | 34,224 | .50 | 282,482 | .852 | 27,182,620 | 2.35 |
| Dates | 3,752 | .05 | 24,217 | .073 | 7,057,882 | .61 |
| Grapes, table | 56,062 | .81 | 355,348 | 1.072 | 27,085,731 | 2.34 |
| Grapes, other | 36,729 | .53 | 261,927 | .790 | 13,486,970 | 1.17 |
| Olives | 8,508 | .12 | 34,295 | .103 | 5,188,159 | .45 |
| Peaches | 24,379 | .35 | 131,058 | .395 | 7,996,900 | .69 |
| Pears | 25,395 | .37 | 156,927 | .473 | 13,552,855 | 1.17 |
| Prunes and plums | 12,265 | .18 | 55,353 | .167 | 8,288,556 | .72 |
| Other fruits | 3,281 | .05 | 10,567 | .032 | 1,432,095 | .12 |
| Total fruits | 295,987 | 4.29 | 1,945,097 | 5.865 | 163,779,273 | 14.15 |
| Nuts: | | | | | | |
| Almonds | 8,490 | .12 | 5,275 | .016 | 2,588,041 | .23 |
| Pecans | 5,264 | .08 | 2,794 | .008 | 2,052,287 | .18 |
| Walnuts | 6,210 | .09 | 5,337 | .016 | 2,701,634 | .23 |
| Other nuts | 15 | | 3 | | 1,850 | |
| Total nuts | 19,979 | .29 | 13,409 | .040 | 7,343,812 | .64 |
| Family gardens and orchards | 20,463 | .30 | | | 4,629,530 | .40 |
| Total all crops | 7,304,021 | 105.86 | 33,162,088 | 100.000 | 1,129,816,883 | 97.61 |
| Less multiple cropped | 556,710 | 8.07 | | | | |
| Total harvested cropland and pasture | 6,747,311 | 97.79 | | | | |
| Cropland not harvested | 135,899 | 1.97 | | | | |
| Soil building | 16,501 | .24 | | | | |
| Acres irrigated | 6,899,711 | 100.00 | | | | |
| Additional revenues [2] | | | | | 27,711,810 | 2.39 |
| Total gross crop value | | | | | 1,157,528,693 | 100.00 |
| Full irrigation service | 3,487,546 | 50.55 | | | 580,485,979 | 50.15 |
| Supplemental irrigation service | 3,362,942 | 48.74 | | | 568,853,368 | 49.14 |
| Temporary irrigation service | 49,223 | .71 | | | 8,189,346 | .71 |

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[1] Additional revenues are included in computing percentages.
[2] Includes payments received from Federal and commercial agencies.

TABLE 8.—*Irrigation and gross crop value data, by projects, for each State, 1960*

| State and project | Irrigable area for service | | | | Irrigated area | Gross crop value | |
|---|---|---|---|---|---|---|---|
| | Full | Supplemental | Temporary | Total | | Amount | Per irrigated acre |
| Arizona: | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | | *Dollars* |
| Gila | 103, 449 | | | 103, 449 | 78, 934 | $15, 130, 194 | 191. 68 |
| Salt River | 238, 357 | 95, 730 | | 334, 087 | 222, 278 | 69, 049, 902 | 310. 65 |
| Yuma (see also California) | 51, 936 | | | 51, 936 | 45, 649 | 24, 793, 175 | 543. 13 |
| Yuma Auxiliary | 3, 406 | | | 3, 406 | 2, 942 | 1, 100, 492 | 374. 06 |
| Totals—Arizona | 397, 148 | 95, 730 | | 492, 878 | 349, 803 | 110, 073, 763 | 314. 67 |
| California: | | | | | | | |
| Boulder Canyon | 604, 718 | | | 604, 718 | 489, 889 | 159, 510, 560 | 325. 61 |
| Cachuma | 500 | 26, 610 | | 27, 110 | 11, 216 | 7, 371, 780 | 657. 26 |
| Central Valley | 33, 855 | 817, 021 | 32, 154 | 883, 030 | 740, 187 | 213, 326, 208 | 288. 21 |
| Klamath (see also Oregon) | 80, 649 | | | 80, 649 | 78, 120 | 11, 284, 488 | 144. 45 |
| Orland | 19, 811 | | | 19, 811 | 17, 440 | 1, 363, 916 | 78. 21 |
| Santa Maria | | 35, 200 | | 35, 200 | 30, 651 | 26, 668, 046 | 870. 05 |
| Solano | | 29, 800 | | 29, 800 | 23, 905 | 7, 034, 035 | 294. 25 |
| Ventura River | 960 | 1, 576 | | 2, 536 | 1, 529 | 1, 023, 828 | 669. 61 |
| Yuma (see also Arizona) | 14, 620 | | | 14, 620 | 10, 749 | 2, 327, 303 | 216. 51 |
| Totals—California | 755, 113 | 910, 207 | 32, 154 | 1, 697, 474 | 1, 403, 686 | 429, 910, 164 | 306. 27 |
| Colorado: | | | | | | | |
| Colorado-Big Thompson | | 720, 000 | | 720, 000 | 720, 000 | 89, 857, 886 | 124. 80 |
| Fruitgrowers Dam | | 2, 662 | | 2, 662 | 1, 962 | 238, 332 | 121. 47 |
| Grand Valley | 34, 686 | 7, 995 | | 42, 681 | 35, 027 | 3, 841, 682 | 109. 63 |
| Mancos | | 8, 650 | | 8, 650 | 7, 166 | 318, 496 | 44. 48 |
| Paonia | | 13, 070 | | 13, 070 | 9, 049 | 1, 614, 127 | 178. 35 |
| Pine River (see also New Mexico) | | 40, 111 | | 40, 111 | 35, 167 | 1, 518, 216 | 43. 18 |
| Pine River Indian Irrigation | | 13, 000 | | 13, 000 | 9, 917 | 383, 994 | 38. 77 |
| Uncompahgre | 76, 457 | | | 76, 457 | 63, 595 | 5, 604, 426 | 88. 12 |
| Totals—Colorado | 111, 143 | 805, 488 | | 916, 631 | 881, 883 | 103, 377, 159 | 117. 22 |
| Idaho: | | | | | | | |
| Avondale | 873 | | | 873 | 508 | 31, 820 | 62. 64 |
| Boise (see also Oregon) | 223, 065 | 136, 115 | | 359, 180 | 322, 916 | 41, 648, 203 | 128. 98 |
| Dalton Gardens | 944 | | | 944 | 595 | 55, 698 | 93. 61 |
| Lewiston Orchards | 3, 595 | | | 3, 595 | 1, 909 | 513, 110 | 268. 78 |
| Little Wood River | | 9, 549 | | 9, 549 | 7, 720 | 471, 628 | 61. 09 |
| Michaud Flats | 9, 720 | | | 9, 720 | 8, 522 | 1, 608, 500 | 188. 75 |
| Minidoka | 214, 642 | 945, 354 | 430 | 1, 160, 426 | 1, 080, 835 | 127, 853, 852 | 118. 29 |
| Owyhee (see also Oregon) | 33, 360 | | | 33, 360 | 31, 289 | 4, 226, 833 | 135. 09 |

TABLE 8.—*Irrigation and gross crop value data, by projects, for each State, 1960*—Continued

| State and project | Irrigable area for service | | | | Irrigated area | Gross crop value | |
|---|---|---|---|---|---|---|---|
| | Full | Supplemental | Temporary | Total | | Amount | Per irrigated acre |
| Idaho—Continued | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | | *Dollars* |
| Preston Bench | | 4,500 | | 4,500 | 4,061 | $343,891 | 84.68 |
| Rathdrum Prairie | 5,010 | | | 5,010 | 4,094 | 441,341 | 107.80 |
| Totals—Idaho | 491,209 | 1,095,518 | 430 | 1,587,157 | 1,462,449 | 177,194,876 | 121.16 |
| Kansas: | | | | | | | |
| Missouri River Basin: | | | | | | | |
| Bostwick division: | | | | | | | |
| Courtland unit | 30,989 | | | 30,989 | 19,955 | 1,640,737 | 82.22 |
| Solomon division: | | | | | | | |
| Kirwin unit | 11,500 | | | 11,500 | 8,216 | 651,841 | 79.34 |
| Webster unit | 4,800 | | | 4,800 | 1,159 | 91,659 | 79.08 |
| Totals—Kansas | 47,289 | | | 47,289 | 29,330 | 2,384,237 | 81.29 |
| Montana: | | | | | | | |
| Bitter Root | 16,665 | | | 16,665 | 16,260 | 645,748 | 39.71 |
| Buffalo Rapids | 22,938 | | | 22,938 | 21,117 | 1,624,092 | 76.91 |
| Frenchtown | 4,810 | | | 4,810 | 4,071 | 190,319 | 46.75 |
| Huntley | 32,447 | | | 32,447 | 24,161 | 1,707,196 | 70.66 |
| Intake | 881 | | | 881 | 781 | 35,383 | 45.30 |
| Lower Yellowstone (see also N. Dak.) | 36,832 | | | 36,832 | 30,192 | 2,315,843 | 76.70 |
| Milk River | 116,062 | | | 116,062 | 87,148 | 3,876,452 | 44.48 |
| Missoula Valley | 977 | | | 977 | 641 | 22,070 | 34.43 |
| Missouri River Basin: | | | | | | | |
| Helena-Great Falls division: | | | | | | | |
| Helena Valley unit | 14,121 | | | 14,121 | 7,305 | 309,165 | 42.32 |
| Three Forks division: | | | | | | | |
| Crow Creek pump unit | 4,545 | | | 4,545 | 3,456 | 304,256 | 88.04 |
| Yellowstone division: | | | | | | | |
| Savage unit | 2,215 | | | 2,215 | 1,934 | 82,484 | 42.65 |
| Sun River | 91,823 | | | 91,823 | 66,843 | 2,688,223 | 40.22 |
| Totals—Montana | 344,316 | | | 344,316 | 263,909 | 13,801,231 | 52.30 |
| Nebraska: | | | | | | | |
| Mirage Flats | 11,662 | | | 11,662 | 11,258 | 1,314,060 | 116.72 |
| Missouri River Basin: | | | | | | | |
| Bostwick division: | | | | | | | |
| Superior-Courtland unit | 22,593 | | | 22,593 | 18,194 | 1,536,806 | 84.47 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Cambridge, Meeker-Driftwood and Red Willow units | 38,322 | | | [illegible] | [illegible] | [illegible] | [illegible] |
| Frenchman unit | | 1,030 | | 1,030 | 984 | 61,653 | 62.66 |
| Middle Loup division: | | | | | | | |
| Sargent unit | 12,900 | | | 12,900 | 7,680 | 558,671 | 72.74 |
| Oregon Trail division: | | | | | | | |
| Glendo unit (see also Wyoming) | | 22,524 | | 22,524 | 17,484 | 2,170,938 | 124.17 |
| North Platte (see also Wyoming) | 171,571 | 92,398 | | 263,969 | 246,160 | 26,176,420 | 106.34 |
| Totals—Nebraska | 257,248 | 115,952 | | 373,200 | 334,458 | 34,546,960 | 103.30 |
| Nevada: | | | | | | | |
| Humboldt | | 39,623 | | 39,623 | 22,822 | 1,611,713 | 70.62 |
| Newlands | 71,901 | | | 71,901 | 57,817 | 3,982,914 | 68.89 |
| Truckee Storage | | 28,755 | | 28,755 | 21,062 | 1,516,758 | 72.01 |
| Totals—Nevada | 71,901 | 68,378 | | 140,279 | 101,701 | 7,111,385 | 69.92 |
| New Mexico: | | | | | | | |
| Carlsbad | 25,055 | | | 25,055 | 20,023 | 3,601,851 | 179.89 |
| Fort Sumner | 6,500 | | | 6,500 | 5,363 | 417,862 | 77.92 |
| Middle Rio Grande | 121,680 | | | 121,680 | 53,799 | 4,322,470 | 80.34 |
| Pine River (see also Colorado) | | | 1,030 | 1,030 | 1,030 | 93,412 | 90.69 |
| Rio Grande (see also Texas) | 102,082 | | | 102,082 | 85,162 | 24,953,072 | 293.01 |
| Tucumcari | 41,411 | | | 41,411 | 31,854 | 1,332,140 | 41.82 |
| Vermejo | 7,379 | | | 7,379 | 4,592 | 162,350 | 35.35 |
| Totals—New Mexico | 304,107 | | 1,030 | 305,137 | 201,823 | 34,883,157 | 172.84 |
| North Dakota: | | | | | | | |
| Buford-Trenton | 7,655 | | | 7,655 | 6,511 | 502,711 | 77.21 |
| Lower Yellowstone (see also Montana) | 19,388 | | | 19,388 | 15,615 | 1,362,850 | 87.28 |
| Missouri River Basin: | | | | | | | |
| Heart Division: | | | | | | | |
| Dickinson unit | 400 | | | 400 | 323 | 26,768 | 82.87 |
| Heart Butte unit | 2,463 | | | 2,463 | 1,413 | 75,509 | 53.44 |
| North Dakota pumping division: | | | | | | | |
| Fort Clark unit | 2,039 | | | 2,039 | 1,040 | 73,516 | 70.69 |
| Totals—North Dakota | 31,945 | | | 31,945 | 24,902 | 2,041,354 | 81.98 |
| Oklahoma: | | | | | | | |
| W. C. Austin | 47,809 | | | 47,809 | 42,161 | 5,793,082 | 137.40 |
| Totals—Oklahoma | 47,809 | | | 47,809 | 42,161 | 5,793,082 | 137.40 |
| Oregon: | | | | | | | |
| Arnold | 4,292 | | | 4,292 | 2,812 | 118,118 | 42.00 |
| Baker | | 7,281 | | 7,281 | 7,260 | 390,480 | 53.79 |
| Boise (see also Idaho) | 1,696 | | | 1,696 | 1,424 | 111,509 | 78.31 |
| Burnt River | | 15,616 | | 15,616 | 15,486 | 799,672 | 51.64 |

TABLE 8.—*Irrigation and gross crop value data, by projects, for each State, 1960*—Continued

| State and project | Irrigable area for service | | | | Irrigated area | Gross crop value | |
|---|---|---|---|---|---|---|---|
| | Full | Supplemental | Temporary | Total | | Amount | Per irrigated acre |
| Oregon—Continued | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | | *Dollars* |
| Crescent Lake Dam | 6,650 | | | 6,650 | 5,994 | $368,641 | 61.50 |
| Crooked River | 8,500 | | | 8,500 | 8,222 | 797,270 | 96.97 |
| Deschutes | 50,000 | 47,743 | 1,247 | 98,990 | 90,577 | 13,567,422 | 149.79 |
| Grants Pass | 10,370 | | | 10,370 | 7,239 | 677,395 | 93.58 |
| Klamath (see also California) | 135,330 | | | 135,330 | 120,596 | 14,195,380 | 117.71 |
| Owyhee (see also Idaho) | 71,656 | 13,000 | | 84,656 | 79,661 | 13,096,107 | 164.40 |
| Rogue River Basin | | 23,801 | | 23,801 | 20,885 | 5,679,137 | 271.92 |
| Umatilla | 17,859 | 13,015 | 513 | 31,387 | 24,558 | 2,308,160 | 93.99 |
| Vale | 32,000 | | | 32,000 | 31,346 | 2,480,793 | 79.14 |
| Wapinitia | 2,108 | | | 2,108 | 1,530 | 108,744 | 71.07 |
| Totals—Oregon | 340,461 | 120,456 | 1,760 | 462,677 | 417,590 | 54,698,828 | 130.99 |
| South Dakota: | | | | | | | |
| Belle Fourche | 57,183 | | | 57,183 | 54,333 | 2,923,534 | 53.81 |
| Missouri River Basin: | | | | | | | |
| Cheyenne division: | | | | | | | |
| Angostura unit | 12,135 | | | 12,135 | 11,371 | 850,055 | 74.76 |
| Rapid Valley | | 8,900 | | 8,900 | 6,617 | 342,648 | 51.78 |
| Totals—South Dakota | 69,318 | 8,900 | | 78,218 | 72,321 | 4,116,237 | 56.92 |
| Texas: | | | | | | | |
| Balmorhea | | 10,608 | | 10,608 | 6,922 | 851,225 | 122.97 |
| Rio Grande (see also New Mexico) | 76,114 | [1] 18,330 | | [2] 94,444 | 67,135 | 17,039,991 | 253.82 |
| Totals—Texas | 76,114 | [2] 28,938 | | [2] 105,052 | 74,057 | 17,891,216 | 241.59 |
| Utah: | | | | | | | |
| Hyrum | | 6,800 | | 6,800 | 6,163 | 338,506 | 54.93 |
| Moon Lake | | 75,256 | | 75,256 | 56,027 | 1,318,014 | 23.52 |
| Newton | | 2,600 | | 2,600 | 2,199 | 117,996 | 53.66 |
| Ogden River | | 23,447 | | 23,447 | 15,847 | 2,231,435 | 140.81 |
| Provo River | | 48,156 | | 48,156 | 42,319 | 4,346,111 | 102.70 |
| Sanpete | | 13,694 | | 13,694 | 11,950 | 510,475 | 42.72 |
| Scofield | | 15,843 | | 15,843 | 10,616 | 682,599 | 64.30 |
| Strawberry Valley | 17,269 | 27,302 | | 44,571 | 41,097 | 3,334,387 | 81.13 |
| Weber River | | 108,978 | | 108,978 | 91,379 | 10,528,033 | 115.21 |
| Totals—Utah | 17,269 | 322,076 | | 339,345 | 277,597 | 23,407,556 | 84.32 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Washington: | | | | | | | |
| Chief Joseph Dam | 2,860 | | | 2,860 | 1,465 | 289,791 | 197.81 |
| Columbia Basin | 425,514 | | | 425,514 | 294,195 | 40,912,096 | 139.06 |
| Okanogan | 5,038 | | | 5,038 | 4,139 | 1,086,717 | 262.56 |
| Yakima | 279,922 | 181,844 | 155 | 461,921 | 393,830 | 75,965,564 | 192.89 |
| Totals—Washington | 713,334 | 181,844 | 155 | 895,333 | 693,629 | 118,254,168 | 170.49 |
| Wyoming: | | | | | | | |
| Eden | 17,022 | | | 17,022 | 12,711 | 295,294 | 23.23 |
| Kendrick | 23,957 | | | 23,957 | 19,759 | 898,384 | 45.47 |
| Missouri River Basin: | | | | | | | |
| Bighorn Basin division: | | | | | | | |
| Hanover-Bluff unit | 6,527 | | | 6,527 | 5,674 | 480,398 | 84.67 |
| Owl Creek unit | | 11,338 | | 11,338 | 9,310 | 498,839 | 53.58 |
| Boysen division: | | | | | | | |
| Boysen unit | | | 19,906 | 19,906 | 17,915 | 1,314,961 | 73.40 |
| Oregon Trail division: | | | | | | | |
| Glendo unit (see also Nebraska) | | 8,732 | | 8,732 | 6,287 | 652,865 | 103.84 |
| North Platte (see also Nebraska) | 54,752 | 16,317 | | 71,069 | 69,477 | 6,272,336 | 90.28 |
| Riverton | 54,337 | | | 54,337 | 49,645 | 2,459,657 | 49,54 |
| Shoshone | 93,529 | | | 93,529 | 77,634 | 5,170,586 | 66.60 |
| Totals—Wyoming | 250,124 | 36,387 | 19,906 | 306,417 | 268,412 | 18,043,320 | 67.22 |
| Totals—All States | 4,325,848 | 3,789,874 | 55,435 | 8,171,157 | 6,899,711 | 1,157,528,693 | 167.76 |

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[1] Area for which service is available under Warren Act contract.

[2] Includes 18,330 acres for which service is available under Warren Act contract.

TABLE 9.—*Accretions to reclamation fund by States, fiscal year 1961*

| | Sale of public land | | Proceeds from Oil Leasing Act | | Total to Ju 30, 1961 |
|---|---|---|---|---|---|
| | Fiscal year 1961 | To June 30, 1961 | Fiscal year 1961 | To June 30, 1961 | |
| Alaska | | | $1,171.68 | $217,568.97 | $217,568 |
| Arizona | $676,835.73 | $6,419,988.36 | 279,778.08 | 1,619,304.70 | 8,039,293 |
| Arkansas | | | 41,355.04 | 152,278.13 | 152,278 |
| California | 1,958,923.92 | 17,646,795.18 | 3,340,076.93 | 85,518,032.96 | 103,164,828 |
| Colorado | 679,550.91 | 12,849,004.61 | 4,606,605.74 | 56,907,128.48 | 69,756,133 |
| Florida | | | 265.38 | 3,487.44 | 3,487 |
| Idaho | 342,140.26 | 9,888,225.10 | 398,030.31 | 1,856,593.13 | 11,744,818. |
| Illinois | | | | 74.81 | 74. |
| Indiana | | | | 84.00 | 84. |
| Kansas | | 1,046,576.99 | 189,733.71 | 962,957.61 | 2,009,534. |
| Louisiana | | | 124,005.19 | 1,505,548.42 | 1,505,548. |
| Michigan | | | 1,310.89 | 35,341.21 | 35,341. |
| Mississippi | | | 3,391.38 | 33,352.72 | 33,352. |
| Montana | 129,100.89 | 17,095,818.50 | 2,270,386.09 | 21,875,511.83 | 38,971,330. |
| Nebraska | 1,286.40 | 2,223,294.97 | 8,760.29 | 99,356.93 | 2,322,651. |
| Nevada | 630,244.02 | 4,280,072.47 | 190,796.31 | 4,304,971.55 | 8,585,044. |
| New Mexico | 238,965.40 | 8,242,890.95 | 9,606,973.15 | 72,104,879.59 | 80,347,770. |
| North Dakota | 908.64 | 12,301,892.18 | 118,559.35 | 1,388,251.04 | 13,690,143. |
| Oklahoma | 18,519.80 | 6,081,955.97 | 54,510.58 | 407,930.33 | 6,489,886. |
| Oregon | 1,132,207.22 | 20,225,259.62 | 72,377.55 | 429,205.56 | 20,654,465. |
| South Dakota | 4,862.40 | 7,898,491.73 | 93,802.53 | 1,171,015.00 | 9,069,506. |
| Utah | 39,071.83 | 5,301,671.58 | 3,892,515.21 | 27,616,679.91 | 32,918,351. |
| Washington | 249,569.20 | 10,167,950.41 | 816.76 | 97,575.53 | 10,265,525. |
| Wyoming | 120,679.46 | 9,972,233.75 | 17,712,192.83 | 194,487,815.05 | 204,460,048. |
| Total | 6,222,866.08 | 151,642,122.37 | 43,007,414.98 | 472,794,944.90 | 624,437,067. |

| Other accretions | Fiscal year 1961 | Total to June 30, 196 |
|---|---|---|
| Proceeds, Federal water power licenses | $72,347.95 | $1,806,829. |
| Proceeds, potassium royalties and rentals | 2,187,495.02 | 23,369,344. |
| Receipts from naval petroleum reserves, 1920-38, act of May 9, 1938 | | 29,778,300. |
| Proceeds from rights-of-way over withdrawn lands, act of July 19, 1919 | 1,338.72 | 15,827. |
| Miscellaneous mineral leasing permits | 150.00 | 617. |
| Miscellaneous items, other | | 5. |
| Total | 2,261,331.69 | 54,970,924. |
| Grand Total | 51,491,612.75 | 679,407,991. |

TABLE 10.—*The reclamation fund, funds available for appropriation, fiscal year 1960–61*

| Receipts and appropriations | Actual 1960 | Actual 1961 |
|---|---|---|
| Unappropriated balance brought forward (as of June 30) | $130,388,611 | $119,663,7 |
| Accretions and collections: | | |
| Bureau of Reclamation (145000.100) | 16,379,781 | 20,034,3 |
| Other agencies (145000.200) | 50,040,920 | 51,491,6 |
| Power revenues (145000.300) | 49,022,147 | 49,302,7 |
| Subtotal, accretions and collections | 115,442,848 | 120,828,6 |
| Plus expired and lapsed appropriations | 680,418 | 2,048,5 |
| Total available for appropriation | 246,511,877 | 242,540,9 |
| Less permanently authorized appropriations for— | | |
| Refunds and returns | | 92,00 |
| Farmers Irrigation District, North Platte Project | 8,000 | 8,00 |
| Deduct annual appropriation for— | | |
| General investigations | 3,742,742 | 3,943,00 |
| Construction and rehabilitation | 95,000,000 | 90,000,00 |
| Operation and maintenance | 23,807,400 | 26,496,00 |
| General administrative expenses | 4,290,000 | 4,290,00 |
| Subtotal, annual appropriation | 126,840,142 | 124,729,00 |
| Total appropriations | 126,848,142 | 124,829,00 |
| Balance carried forward | 119,663,735 | 117,711,98 |

# *Bonneville Power Administration*

**Charles F. Luce,** ***Administrator***

Bonneville Power Administration, authorized by the Bonneville Project Act of 1937, is the designated marketing agency of the Department of the Interior for 20 hydroelectric generating plants of the Columbia River power system currently completed or under construction.

## *Federal Projects*

Power was marketed during fiscal year 1961 from nine Corps of Engineers plants and four of the Department's Bureau of Reclamation plants with an installed generating capacity of 6,189,250 kilowatts.

Completion of the projects under construction will bring the nameplate rating to 8,389,250 kilowatts, and completion of the authorized projects to 9,303,250 kilowatts. Projects existing, under construction, and authorized for construction, by the Corps of Engineers and Bureau of Reclamation are shown in table I.

## *Generation Added*

Columbia River power system additions in fiscal year 1961 have a nameplate rating of 156,000 kilowatts. The last two units of 78,000 kilowatts each were added at the Corps of Engineers project, The Dalles.

TABLE 1.—*U.S. Columbia River power system—General specifications, projects existing, under construction and authorized June 30, 1961*

| Project | Operating agency [1] | Location | Stream | Plant installations | | Date in service (initial unit) | Generation (fiscal year 1961) |
|---|---|---|---|---|---|---|---|
| | | | | Number of units | Total capacity kilowatts [2] | | |
| Existing: | | | | | | | |
| Bonneville | CE | Washington-Oregon | Columbia | 10 | 518,400 | June 1938 | 3,178 |
| Grand Coulee | BR | Washington | do | 18 | 1,944,000 | September 1941 | 11,855 |
| Hungry Horse | BR | Montana | South Fork Flathead | 4 | 285,000 | October 1952 | 833 |
| Detroit | CE | Oregon | North Santiam | 2 | 100,000 | July 1953 | 266 |
| McNary | CE | Washington-Oregon | Columbia | 14 | 980,000 | November 1953 | 4,511 |
| Big Cliff | CE | Oregon | North Santiam | 1 | 18,000 | June 1954 | 104 |
| Lookout Point | CE | do | Middle Fork Willamette | 3 | 120,000 | December 1954 | 208 |
| Albeni Falls | CE | Idaho | Pend Oreille | 3 | 42,600 | March 1955 | 162 |
| Dexter | CE | Oregon | Middle Fork Willamette | 1 | 15,000 | May 1955 | 73 |
| Chief Joseph | CE | Washington | Columbia | 16 | 1,024,000 | August 1955 | 4,535 |
| Chandler | BR | do | Yakima | 2 | 12,000 | February 1956 | 63 |
| The Dalles | CE | Washington-Oregon | Columbia | 16 | 1,119,000 | May 1957 | 4,387 |
| Roza | BR | Washington | Yakima | 1 | 11,250 | August 1958 | 55 |
| Subtotal | | | | | 6,189,250 | | 30,230 |
| Under Construction: | | | | | | | |
| Ice Harbor | CE | Washington | Snake | 3 | 270,000 | December 1961 | |
| Hills Creek | CE | Oregon | Middle Fork Williamette | 2 | 30,000 | February 1962 | |
| Cougar | CE | do | South Fork McKenzie | 2 | 25,000 | November 1963 | |
| Green Peter | CE | do | Middle Santiam | 2 | 90,000 | April 1966 | |
| Foster | CE | do | South Santiam | 2 | 30,000 | April 1967 | |
| John Day | CE | Washington-Oregon | Columbia | 10 | 1,350,000 | June 1967 | |
| Lower Monumental | CE | Washington | Snake | 3 | 405,000 | December 1967 | |
| Subtotal | | | | | 2,200,000 | | |
| Authorized: | | | | | | | |
| Libby | CE | Montana | Kootenai | 4 | 344,000 | | |
| Little Goose | CE | Washington | Snake | 3 | 405,000 | | |
| Lower Granite | CE | do | do | 3 | 405,000 | | |
| Subtotal | | | | | 1,154,000 | | |
| Total, 23 projects | | | | | 9,543,250 | | |

[1] CE—Corps of Engineers; BR—Bureau of Reclamation.

[2] Nameplate rating.

*A lineman attaches the lead or "sock" line to helicopter for a 2,000 foot run to bridge a deep, precipitous canyon with Bonneville Power Administration's Rocky Reach-Maple Valley 345,000 volt transmission line.*

Existing storage capacity usable for power in Federal reservoirs is 9,868,500 acre feet. An additional 414,000 acre feet will be provided by Cougar and Hills Creek on which construction is under way, and 5,343,000 acre feet will be provided by Libby and Green Peter projects which are authorized for construction.

All generation and storage capacity under Federal construction will be in service by October 1968 under the present schedule. Service dates for the other authorized projects are not yet scheduled.

### *Non-Federal Projects*

Addition of 541,500 kilowatts of nameplate rating by non-Federal utilities increased the generating capacity of non-Federal resources in the area served by the Bonneville Power Administration to a total of 4,186,080 kilowatts.

Future additions under construction or licensed for construction by non-Federal utilities would add 2,077,550 kilowatts to the area's resources.

## *Northwest Power Pool*

Generation by the principal electric utility systems of the Pacifi Northwest during the fiscal year 1961 is shown in the accompanyin chart.

All utilities listed are members of the Northwest Power Pool wit the exception of Pend Oreille County Public Utility District. Pen Oreille County Public Utility District is included because it provide a substantial part of its generation to the pool. The Utah Powe and Light Company and the British Columbia Electric Company ar members of the pool, but are not included as their major service area are outside the region.

The Columbia River power system provided a total of 55.5 percen of the energy generated by the major utilities of the region. Bonne ville Power Administration provided 6.7 billion kilowatt-hours o energy to meet the net requirements of seven other pool utilities i addition to its other load.

Bonneville Power Administration's electric energy account for fisca year 1961 is shown in table II.

## *Transmission Network*

Bonneville Power Administration, as part of its marketing func tion, is responsible for construction, operation, and maintenance o transmission facilities to transmit the power to the region's loa centers. The BPA transmission grid at the end of the fiscal yea consisted of 8,155 circuit miles of high voltage transmission lines an 208 substations.

TABLE II.—*Electric energy account for fiscal year 1961*

| | |
|---|---|
| Energy received (millions of kilowatt-hours): | |
| Energy generated for BPA: | |
| Bureau of Reclamation | 12, 80 |
| Corps of Engieers | 17, 42 |
| Power interchanged in | 8, 66 |
| Total received | 38, 89 |
| Energy delivered (millions of kilowatt-hours): | |
| Sales | 28, 52 |
| Power interchanged out | 8, 56 |
| Used by Administration | 34 |
| Total delivered | 37, 12 |
| Energy losses in transmission and transformation | 1, 772 |
| Losses in percent of total received—percent | 4. 6 |
| Maximum demand on Federal plants (kilowatts) Sept. 26, 1960, 6–7 p.m. PST. | 4, 579, 000 |
| Load factor, total generated for BPA, percent | 75. 4 |

*spended 230,000 volt lightning arresters form an intricate pattern atop the cNary Dam powerhouse.*

## *lectrical Coordination and Integration*

Bonneville Power Administration's high voltage transmission rid serves as the "backbone" for all interconnected utilities of the acific Northwest. The BPA transmission system had 436 points f connection as of June 30, 1961, almost double the 256 connections f 11 years ago. These include interconnections with all the principal ilities having generating facilities in the region.

### *Growth of Wheeling Program*

The wheeling program under which the Federal transmission grid is made available for transmission of non-Federal power generation to area load centers increased by 31.7 percent in fiscal year 1961 over the previous year.

Bonneville Power Administration wheeled or transferred for other utilities 8.8 billion kilowatt-hours of energy as compared to 6.7 billion kilowatt-hours the previous year. During the same period other utilities wheeled or transferred 2.2 billion kilowatt-hours of energy for the Government.

Power is being delivered under long-term firm capacity contracts from the Pelton project of the Portland General Electric Co., the Box Canyon project of the Pend Oreille Public Utility District, the Priest Rapids project of the Grant County Public Utility District, and the Rocky Reach project of the Chelan County Public Utility District.

Excess capacity contracts cover power from the Swift project of the Pacific Power and Light Company, the Rock Island project of the Grant County Public Utility District; and into the region from the Idaho Power Company.

### *Public Utility Sales Increase*

Sales to publicly owned utilities continued to increase at a higher rate than sales to other classes of customers. Over the last 10-year period sales to publicly owned utilities increased 224 percent, while total sales increased 89 percent. During the same period, energy sales to the other classes of customers increased as follows: private utilities, 20 percent; aluminum companies, 31 percent; and Federal agencies and other customers 198 percent.

Detail of energy deliveries by classes of customers for 1961 compared with 1960 are shown in table III.

### *Unused Capacity*

Bonneville's industrial customers have, in the aggregate, an estimated capacity to use power at the rate of approximately 1,900,000 kilowatts. As of June 30, 1961, their power purchases from the Government and from other sources totaled 1,472,000 kilowatts, leaving idle plant capacity of about 430,000 kilowatts. Firm deliveries from the Government were 1,089,000 kilowatts, interruptible deliveries were 246,000 kilowatts, and 137,000 kilowatts were purchased from non-Federal sources.

TABLE III.—*Sales of electric energy by classes of customers*

| | Fiscal year 1961 | | Fiscal year 1960 | | Percent increase |
|---|---|---|---|---|---|
| | Millions of kilowatt-hours | Mills per kilowatt-hour | Millions of kilowatt-hours | Mills per kilowatt hour | |
| Publicly owned utilities:[1] | | | | | |
| Firm | 10,876 | 2.72 | 10,418 | 2.71 | 4.4 |
| Nonfirm | 198 | 2.51 | 135 | 2.52 | 45.7 |
| Total | 11,074 | 2.71 | 10,553 | 2.70 | 4.9 |
| rivately owned utilities: | | | | | |
| Firm | 3,587 | 2.23 | 4,599 | 2.16 | −22.0 |
| Nonfirm | 722 | 2.50 | 954 | 2.50 | −24.3 |
| Total | 4,309 | 2.28 | 5,553 | 2.21 | −22.4 |
| Aluminum plants: | | | | | |
| Firm | 7,431 | 2.01 | 7,761 | 1.98 | −4.2 |
| Nonfirm | 1,128 | 1.76 | 1,167 | 1.82 | −3.3 |
| Total | 8,559 | 1.98 | 8,928 | 1.96 | −4.1 |
| Other industries:[2] | | | | | |
| Firm | 4,193 | 2.24 | 4,098 | 2.26 | 2.3 |
| Nonfirm | 393 | 2.24 | 515 | 2.20 | −23.7 |
| Total | 4,586 | 2.24 | 4,613 | 2.25 | −0.6 |
| Total energy: | | | | | |
| Firm | 26.087 | 2.37 | 26,876 | 2.33 | −2.9 |
| Nonfirm | 2,441 | 2.11 | 2,771 | 2.16 | −11.9 |
| Total | 28,528 | 2.35 | 29,647 | 2.32 | −3.8 |

[1] City of Richland billed to Atomic Energy Commission July through October 1959. Data have been shifted from Federal agencies for comparative purposes.
[2] Includes Federal agencies.

## *Construction Program*

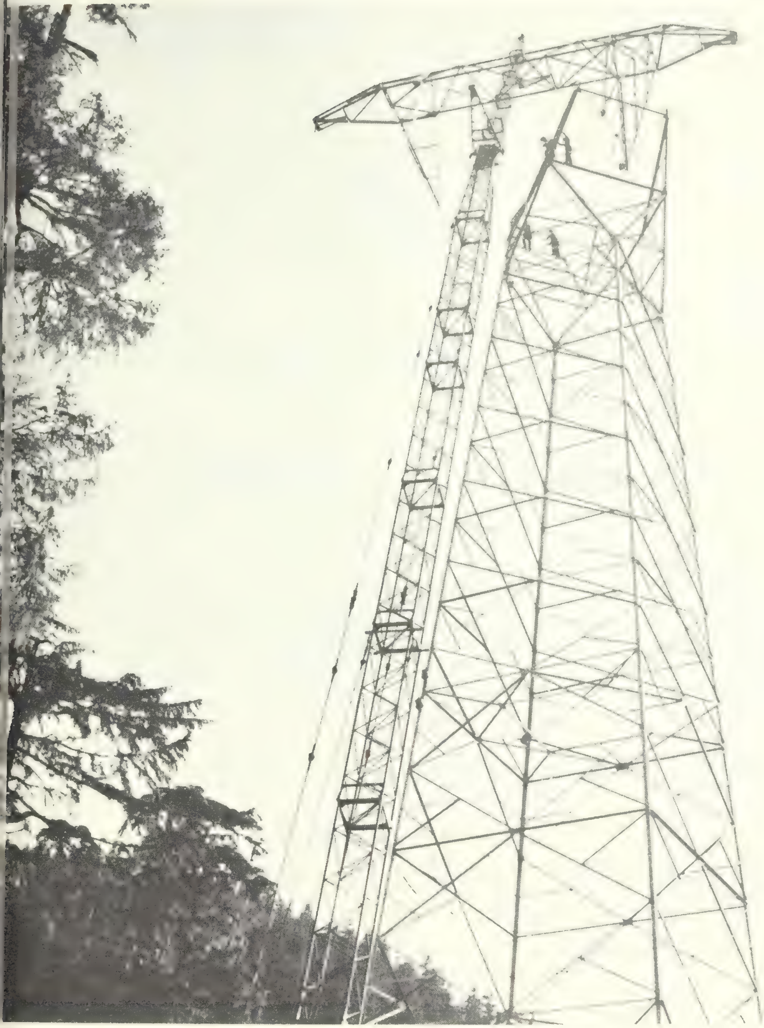
Bonneville Power Administration's grid was expanded by the addition of 196 circuit miles of transmission lines, 363,625 kilovolt amperes of substation transformer capacity and 534,360 kilovolt amperes of reactive. At the close of the year, the grid consisted of 8,224 miles of transmission lines, 14,472,747 kilovolt amperes of transformer capacity and 2,435,545 kilovolt amperes of reactive. Eight new substations were added to the system for a total of 208 substations.

Major facilities completed include the 113 mile, 287,000 volt line between Columbia, near Wenatchee, Washington and Covington, near Seattle, Wash., to integrate into the system and to carry the output of Grant County Public Utility District's Priest Rapids and Chelan County Public Utility District's Rocky Reach hydroelectric projects into the Puget Sound area; a 23 mile, 230,000 volt line from Rocky Reach hydroelectric project to Columbia, near Wenatchee, to integrate the output into the BPA system; an additional 230,000 volt line from The Dalles hydroelectric project and the Big Eddy

*Water from the Hungry Horse storage reservoir puts on a spectacular display a it leaves the generator penstocks. Before it reaches the sea, it will generate additional power at every major Federal and non-Federal Columbia River powe project downstream from Hungry Horse.*

substation, to carry added generation; a 53 mile, 115,000 volt lin between DeMoss and Fossil, Oreg., to improve service to the electri cooperatives in north central Oregon. An additional 250,000 kilovol ampere transformer was installed at the Longview substation to serv the load growth in that area.

Construction was underway at the close of the fiscal year on a 128 mile, 345,000 volt line from Chelan County Public Utility District's Rocky Reach hydroelectric project to Maple Valley, near Seattle Wash., to bring the generation to western Washington; a 9 mile, double circuit 115,000 volt line to integrate the output of the Corps of Engineers' Ice Harbor hydroelectric project into the BPA system near Pasco, Wash.; an 81 mile, 345,000 volt line, between The Dalles hydroelectric project and McLoughlin substation, near Oregon City, Oreg. a 130 mile, 115,000 volt line between Redmond and Burns, Oreg.; and a 5 mile, 115,000 volt line between the Corps of Engineers' Hills Creek hydroelectric plant and Oakridge, Oreg.



*l line crew working at the 4,000-foot level in the rugged Cascade range near noqualmie Pass, prepare to place the bridge in place on a 115-foot steel transiission tower of the Rocky Reach-Maple Valley 345,000 volt transmission line. 'he 128-mile line, scheduled for initial energization at 230,000 volts this winter, urries power from the Rocky Reach and other mid-Columbia projects to western 'ashington load centers.*

## *nergy Sales of 28.5 Billion Kw.-hr.*

During fiscal year 1961, BPA sold 28.5 billion kilowatt-hours of lectric energy for $67,100,000, an average of 2.35 mills per kilowatt-our. Energy sales were approximately 4 percent below the previous ear.

Percentage distribution of energy sales by classes of customers fo fiscal year 1961 follow:

| | Number of customers, June 1961 | Energy sale by percent of total |
|---|---|---|
| Publicly owned utilities | 81 | 38. |
| Privately owned utilities | 8 | 15. |
| Aluminum industry | 9 | 30. |
| Other industries and Federal agencies | 18 | 16. |
| Total | 116 | 100. |

### *Power Rates*

Bonneville Power Administration has maintained the same basi wholesale rate level since beginning of operations in 1938. Pursuan to action taken during 1959, the existing rates will continue until December 20, 1964.

During fiscal year 1961, BPA delivered about 67 percent of it energy sales at an average cost of 2.19 mills per kilowatt-hour t industries and to utilities having substantial generating facilities.

A summary of energy sales for fiscal year 1961, classified by rat schedules, is shown in table IV.

TABLE IV.—*Sales of electric energy by rate schedules fiscal year 1961*

| Rate schedule | Millions of kilowatt-hours | Percent of total | Percent change from fiscal year 1960 | Mills per kilowatt-hour |
|---|---|---|---|---|
| C-4 [1] | 19,105 | 67.0 | −7.2 | 2.1 |
| F-4 | 51 | 0.2 | −8.9 | 4.6 |
| A-4 [1] | 2,373 | 8.3 | 10.0 | 1.6 |
| E-4 | 5,972 | 20.9 | 5.9 | 3.0 |
| H-3 | 1,013 | 3.6 | −14.3 | 2.5 |
| Space heating | 14 | (2) | (3) | 1.0 |
| Total | 28,528 | 100.0 | −3.8 | 2.3 |

Major features of rate schedules:

| | |
|---|---|
| C-4 | Kilowatt-year for transmission system firm power. |
| F-4 | Demand-energy rate for firm power. |
| A-4 | Kilowatt-year rate for at-site firm power. |
| E-4 | Demand-energy rate for firm power for resale to ultimate consumers. |
| H-3 | Energy rate for dump, emergency, breakdown or experimental service. |
| Space heating | Special space heating rate applicable in vicinity of Grand Coulee plant. |

[1] Includes interruptible industrial sales.
[2] Less than 0.05%.
[3] Initial service under this rate September 1959.

### *Financial Condition*

Since fiscal year 1957 the BPA gross operating revenues have not kept pace with generating capability. Gross revenues for 1961 were only 5 percent more than for 1957. During this same 4 year period,

*hief Joseph Dam, one of the recently completed mid-Columbia projects supplies ower for central and northwest Washington loads of Bonneville Power dministration.*

nstalled capacity increased 32 percent. In the preceding 3 years, hat is, 1957 compared with 1954, revenues increased 47 percent and apability 49 percent.

The lack of continued growth in gross revenues during the past 4 ears reflects the economic recession, which had a particularly severe mpact upon power sales to the aluminum industries served by BPA, nd the development of non-Federal power supplies by BPA customers, thereby displacing its sales.

This adverse sales trend, together with increased costs which necessarily have accompanied the additions to both transmission and generating plant capacities, has resulted in unfavorable net financial results of operations during these 4 years.

Nevertheless, as of June 30, 1961, the BPA was $26.4 million ahead of schedule in the repayment of its investment to the Treasury. These financial results pertain only to the Bonneville Power Administration and not to the U.S. Columbia River Power System which ncludes the generating projects as well as the Administration's transmission system. For the power system as a whole, the repayment of the investment, on June 30, 1961, was $37.8 million ahead of schedule. These data are computed on a payout basis.

Revenues have not kept pace with the additions to the power system's generating capability. As a result, substantial amounts of both firm and secondary power have gone unsold. The accompanying chart compares the amounts of unsold power with the payout deficit for the power system as a whole during the past 4 years together with a forecast for the ensuing 4 years. In every year the unrealized revenues were more than twice the total system payout deficit. In other words, had half, or even considerably less than half in some years, of the available unsold capability been marketed, the power system would have continued to operate in the black.

Bonneville Power Administration is sold out of long-term firm power. Historically, the Administration has had no difficulty in marketing its firm power when available on a long-term contractual basis. Presently, BPA has inquiries from established industrial firms for substantial quantities of long-term firm power. The principal current financial problem is developing markets for large blocks of secondary power and unsold short-term firm power held in reserve for normal load growth.

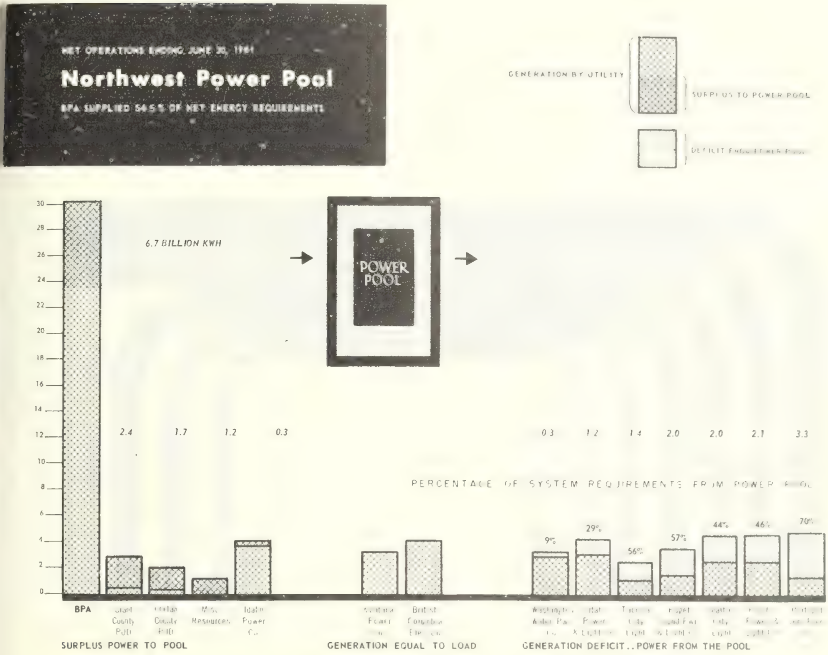
Unsold power in 1961 represented $31.5 million in potential gross sales and the forecast for 1962 is equivalent to $30.7 million of potential revenue. The chart indicates there will be substantial amounts of unsold power through 1965, but it is anticipated that all of the firm power capability will have been sold by that time.

### *Financial Results*

Financial results of operations for the Bonneville Power Administration for fiscal year 1961 compared with fiscal year 1960 are shown in summary form in tables V, VI and VII. These data are necessarily preliminary inasmuch as the annual audit by the General Accounting Office was not complete at the time of the preparation of these statements. However, it is anticipated that final figures will not differ materially from those now available.

The financial information is presented on two bases: (1) an accrued cost accounting basis in accordance with the uniform system of accounts prescribed by the Federal Power Commission for electric utilities, and (2) a payout basis.

The principal differences between these methods are: (1) payout is based on cash receipts rather than accrued revenues but it does include accrued expenses with the exception of noncash exchange account items; (2) in lieu of depreciation expense payout substitutes



amortization of the capital investment over periods of time shorter than the estimated service lives used in cost accounting for determining depreciation expense; and (3) payout provides for use of power revenue receipts to assist in the repayment of irrigation costs, whereas cost accounting does not include such payments as power costs.

It should be noted that payout requirements govern the system rate level because cash receipts must be adequate to cover total payout requirements assigned to be repaid from power operations for all of the projects in the Columbia River Power System.

## *Statement of Revenues and Expenses*

A comparative statement of the revenues and expenses of the Bonneville Power Administration on a cost accounting basis for the fiscal years 1960 and 1961 is presented in table V. Energy sales decreased by $1,949,506 or 2.83 percent during the year. Other electric revenue increased by $653,152, or 31.8 percent, the large increase being due mainly to the increase in wheeling energy from non-Federal projects to load centers. Total operating revenue in 1961 was $69,701,865, which was 1.83 percent lower than the revenue of $70,998,219 for 1960.

Table V.—*Bonneville Power Administration: Comparative statement of revenue and expenses, fiscal years 1960 and 1961 (preliminary)*

[Cost accounting basis]

| | Fiscal year 1960 | Fiscal year 1961 | Increase or decrease | Total to Jun 30, 1961 |
|---|---|---|---|---|
| Operating revenues: | | | | |
| Sales of electric energy | $68, 944, 050 | $66, 994, 544 | ($1, 949, 506) | $785, 236, 98 |
| Other electric revenue | 2, 054, 169 | 2, 707, 321 | 653, 152 | 19, 014, 97 |
| Total operating revenue | 70, 998, 219 | 69, 701, 865 | (1, 296, 354) | 804, 251, 95 |
| Less revenues allocated to generating projects: | | | | |
| Bonneville Dam | 2, 100, 000 | 2, 100, 000 | | 67, 925, 43 |
| Columbia Basin project | 12, 800, 000 | 12, 800, 000 | | 187, 158, 68 |
| Hungry Horse | 3, 833, 000 | 3, 833, 000 | | 31, 073, 21 |
| Albeni Falls | 1, 400, 000 | 1, 200, 000 | (200, 000) | 9, 775, 00 |
| McNary | 9, 000, 000 | 8, 200, 000 | (800, 000) | 72, 110, 00 |
| Detroit-Big Cliff | 1, 700, 000 | 1, 400, 000 | (300, 000) | 14, 240, 00 |
| Lookout Point-Dexter | 1, 700, 000 | 1, 400, 000 | (300, 000) | 11, 400, 00 |
| Chief Joseph | 6, 500, 000 | 6, 500, 000 | | 30, 650, 00 |
| Yakima-Kennewick and Roza | 345, 000 | 345, 000 | | 1, 631, 00 |
| The Dalles | 7, 700, 000 | 10, 800, 000 | 3, 100, 000 | 25, 820, 00 |
| Total revenues allocated to generating projects | 47, 078, 000 | 48, 578, 000 | 1, 500, 000 | 451, 783, 32 |
| Operating revenues allocated to Bonneville Power Administration | 23, 920, 219 | 21, 123, 865 | (2, 796, 354) | 352, 468, 63 |
| Less operating expenses: | | | | |
| Purchased power | 652, 314 | 696, 859 | 44, 545 | 10, 204, 71 |
| Operation, maintenance, administration, etc | 11, 493, 368 | 12, 290, 512 | 797, 144 | 133, 249, 97 |
| Total operating expenses | 12, 145, 682 | 12, 987, 371 | 841, 689 | 143, 454, 69 |
| Less interest and other deductions: | | | | |
| Interest on Federal investment | 8, 707, 281 | 9, 259, 321 | 552, 040 | 91, 078, 05 |
| Less amount charged to construction | 389, 960 | 555, 390 | 165, 430 | 8, 257, 15 |
| Miscellaneous income deductions, net | 9, 423 | 23, 907 | 14, 484 | 1, 507, 91 |
| Total interest and other deductions | 8, 326, 744 | 8, 727, 838 | 401, 094 | 84, 328, 81 |
| Net revenues available for depreciation and amortization of Federal investment | 3, 447, 793 | (591, 344) | (4, 039, 137) | 124, 685, 131 |
| Less depreciation and amortization | 12, 067, 262 | 11, 670, 101 | (397, 161) | 121, 578, 80 |
| Net revenues | (8, 619, 469) | (12, 261, 445) | (3, 641, 976) | 3, 106, 32 |

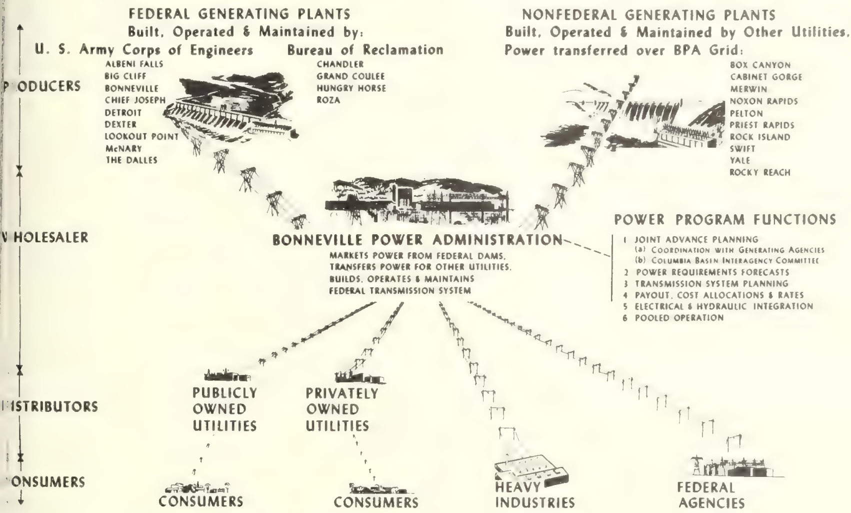
In fiscal year 1961, after the allocations of receipts to the generating projects, revenues were $591,344 less than the BPA's aggregate expenses for operation, maintenance, administration, marketing and interest. This deficit compares with a surplus of $3,447,793 in 1960. After provision for depreciation expense, $11,670,101, the net deficit in 1961 was $12,261,445 compared with $8,619,469 in 1960.

On a cumulative basis through June 30, 1961, revenues available to BPA after allocations to the generating projects were $352,468,639. These revenues exceeded the BPA's total operating expenses of $143,454,694 plus total interest and miscellaneous expenses of $84,328,814 by $124,685,131. This excess provided for cumulative depreciation expense of $121,578,808, and resulted in net revenues of $3,106,323.

Revenues allocated to the Federal generating projects that supplied power to the Bonneville Power Administration totaled $48,578,000

1961, an increase of $1,500,000 over 1960. These allocations are independent of the amount of energy generated but are geared to the schedules necessary to repay the costs allocated to power, and for financial assistance in irrigation repayments. However, in recent years actual allocations have been less than the scheduled amounts because of the unfavorable revenue trend. Nevertheless, as stated elsewhere, because of surpluses accumulated in earlier years, the repayment of the investment continues to be substantially ahead of schedule. Such costs include operating expenses, interest on and amortization of the power capital investment at all the generating projects, plus financial assistance to irrigation repayment in the case of the Columbia Basin and the Yakima projects.

Functions of Bonneville Power Administration


FEDERAL GENERATING PLANTS
Built, Operated & Maintained by:
U. S. Army Corps of Engineers
ALBENI FALLS
BIG CLIFF
BONNEVILLE
CHIEF JOSEPH
DETROIT
DEXTER
LOOKOUT POINT
McNARY
THE DALLES
Bureau of Reclamation
CHANDLER
GRAND COULEE
HUNGRY HORSE
ROZA
NONFEDERAL GENERATING PLANTS
Built, Operated & Maintained by Other Utilities.
Power transferred over BPA Grid:
BOX CANYON
CABINET GORGE
MERWIN
NOXON RAPIDS
PELTON
PRIEST RAPIDS
ROCK ISLAND
SWIFT
YALE
ROCKY REACH
PRODUCERS
WHOLESALER
DISTRIBUTORS
CONSUMERS
BONNEVILLE POWER ADMINISTRATION
MARKETS POWER FROM FEDERAL DAMS.
TRANSFERS POWER FOR OTHER UTILITIES.
BUILDS, OPERATES & MAINTAINS
FEDERAL TRANSMISSION SYSTEM
POWER PROGRAM FUNCTIONS
1 JOINT ADVANCE PLANNING
(a) COORDINATION WITH GENERATING AGENCIES
(b) COLUMBIA BASIN INTERAGENCY COMMITTEE
2 POWER REQUIREMENTS FORECASTS
3 TRANSMISSION SYSTEM PLANNING
4 PAYOUT, COST ALLOCATIONS & RATES
5 ELECTRICAL & HYDRAULIC INTEGRATION
6 POOLED OPERATION
PUBLICLY OWNED UTILITIES
PRIVATELY OWNED UTILITIES
CONSUMERS
CONSUMERS
HEAVY INDUSTRIES
FEDERAL AGENCIES

### *Comparative Balance Sheet*

Table VI is a condensed statement of assets and liabilities on a cost accounting basis for the investment in Bonneville Power Administration as of June 30, 1960 and 1961. Electric transmission plant in service at the end of 1961 was $471,363,377, an increase of $20,433,786 during the year. Construction work in progress at the end of the year was $31,997,123, an increase over 1960 of $4,328,398. The total investment in electric transmission plant increased $24,771,404.

TABLE VI.—*Bonneville Power Administration: Condensed statement of asset and liabilities as of June 30, 1960 and 1961 (preliminary)*

[Cost accounting basis]

| | Fiscal year 1960 | Fiscal year 1961 | Increase or decrease |
|---|---|---|---|
| ASSETS | | | |
| Electric plant—original cost: | | | |
| Electric plant in service | $450,929,591 | $471,363,377 | $20,433,786 |
| Electric plant leased to others | 445,307 | 445,307 | |
| Construction work in progress | 27,668,725 | 31,997,123 | 4,328,398 |
| Electric plant held for future use | 869,741 | 878,961 | 9,220 |
| Total electric plant | 479,913,364 | 504,684,768 | 24,771,404 |
| Less reserve for depreciation | 96,992,049 | 106,683,099 | 9,691,050 |
| Original cost less reserves | 382,921,315 | 398,001,669 | 15,080,354 |
| Current assets: | | | |
| Unexpended funds | 20,379,457 | 13,650,761 | (6,728,696 |
| Special funds | 692,210 | 738,437 | 46,227 |
| Accounts receivable: | | | |
| Customers | 10,390,953 | 9,579,440 | (811,513 |
| Others | 352,286 | 355,860 | 3,574 |
| Material and supplies | 5,058,948 | 4,523,980 | (534,968 |
| Total current assets | 36,873,854 | 28,848,478 | (8,025,376 |
| Other assets and deferred charges | 1,864,284 | 598,451 | (1,265,833 |
| Total assets | 421,659,453 | 427,448,598 | 5,789,145 |
| LIABILITIES | | | |
| Investment in U.S. Government: | | | |
| Congressional appropriations | 606,329,912 | 636,233,139 | 29,903,227 |
| Transfers [1] | 18,114,857 | 19,096,834 | 981,977 |
| Interest on Federal Investment: | | | |
| Charged to operations | 73,111,455 | 81,818,736 | 8,707,281 |
| Charged to construction | 8,707,281 | 9,259,321 | 552,040 |
| Continuing fund | 1,833,035 | 1,833,035 | |
| Gross investment | 708,096,540 | 748,241,065 | 40,144,525 |
| Less funds returned | 309,865,071 | 332,133,255 | 22,268,184 |
| Net investment | 398,231,469 | 416,107,810 | 17,876,341 |
| Accumulated net revenues: | | | |
| Balance June 30, 1959 and 1960 | 23,987,237 | 15,367,768 | (8,619,469) |
| Net revenue for year | (8,619,469) | (12,261,445) | (3,641,976) |
| Balance June 30, 1960 and 1961 | 15,367,768 | 3,106,323 | (12,261,445) |
| Total investment | 413,599,237 | 419,214,133 | 5,614,896 |
| Current and accrued liabilities: | | | |
| Accounts payable | 5,329,472 | 5,325,644 | (3,828) |
| Employees accrued leave | 2,261,177 | 2,471,786 | 210,609 |
| Total | 7,590,649 | 7,797,430 | 206,781 |
| Deferred credits | 469,567 | 437,035 | (32,532) |
| Total liabilities | 421,659,453 | 427,448,598 | 5,789,145 |

[1] Consists of goods and services furnished without charge by other Federal agencies less such items furnished to other agencies by BPA.

The gross investment of the Federal Government in Bonneville Power Administration increased $40,144,525 in fiscal year 1961. These gross amounts include, in addition to transmission capital investment, the amounts necessary for operation, maintenance and interest expenses. Funds returned to the Treasury by BPA after deducting amounts allocated to the generating projects increased $22,268,184, with the result that the unpaid investment owing to the Treasury increased only $17,876,341.

## *Repayment of Federal Investment*

The amount of the Federal investment in the Bonneville Power Administration and the status of repayment on a payout basis as of June 30, 1961, are shown in table VII. From the inception of operations to June 30, 1961, the Bonneville Power Administration has returned cash receipts to the Treasury in the aggregate amount of $783,916,575. Of this total, $451,783,320 has been allocated to the generating projects and $332,133,255 to the transmission system. These receipts have reimbursed the Federal Treasury in full for Bonneville Power Administration's expenses of operation, maintenance, marketing, administration, etc., totaling $122,396,342, and have repaid interest on the transmission investment in the amount of $82,820,898 with the balance of $126,916,015 applied to repayment of the capital investment. This capital repayment exceeded scheduled amortization requirements by $26,398,015 and represented repayments of 24 percent of the total capital investment of $529,373,064.

TABLE VII.—*Bonneville Power Administration—summary of Federal investment in transmission system and repayment as of June 30, 1961 (preliminary)*

[Payout basis]

| | Gross investment | Repayments | Net investment |
|---|---|---|---|
| nvestment in current expenses: | | | |
| Operation, maintenance, etc | $122, 396, 342 | $122, 396, 342 | |
| Interest | 82, 820, 898 | 82, 820, 898 | |
| Total current expenses | 205, 217, 240 | 205, 217, 240 | |
| nvestment in capital assets: | | | |
| Electric plant investment and other capital assets | 529, 373, 064 | [1] 126, 916, 015 | $402, 457, 049 |
| Unexpended appropriations | 13, 650, 761 | | 13, 650, 761 |
| Total capital investment | 543, 023, 825 | 126, 916, 015 | 416, 107, 810 |
| Total federal investment | 748, 241, 065 | [2] 332, 133, 255 | 416, 107, 810 |

[1] Consists of $100,518,000 scheduled amortization and $26,398,015 repaid in excess of scheduled requirenents. The total repayment, $126,916,015 equals 24.0 percent of the invested capital of $529,373,064.

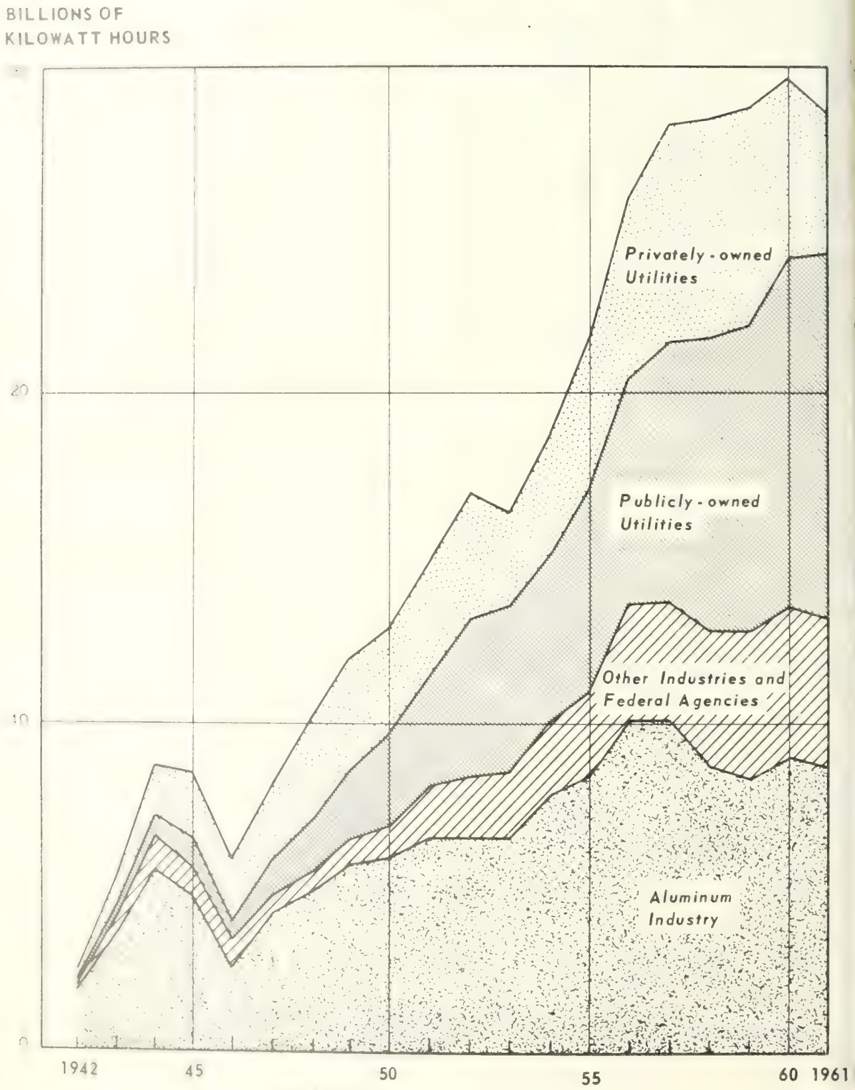
[2] Total cash receipts covered into the U.S. Treasury by BPA to June 30, 1961 ... $783, 916, 575
Less amounts allocated to generating projects ... 451, 783, 320

Cash receipts allocated to Bonneville Power Administration ... 332, 133, 255

## *Power Marketing Outlook*

The Bonneville Power Administration is taking vigorous action to market both firm and secondary power supplies. This action includes reactivation of the Power Marketing and Utilization Division, together with a stepped up marketing program. Such a program is imperative if Bonneville Power Administration is to wipe out the current annual payout deficit and avoid the threat of increased power rates in the near future.

# Sales of Electric Energy by Class of Customer



Significant developments during the year in power marketing included the Treaty with Canada relating to cooperative development of the water resources of the Columbia River Basin, the proposal for adding generators at Hanford, the study of the Pacific Northwest-Pacific Southwest intertie, and sale of additional firm power for new large electroprocess industries.

The Treaty with Canada was signed in January and ratified by the United States in March. Ratification is now pending in Canada. The Treaty would provide about 2 million kilowatts of dependable capacity in the United States, including the downstream benefits from three storage dams to be constructed in Canada as well as Libby Dam in the United States. Cost of power resulting from the Treaty under initial conditions will be about $14 per kilowatt-year delivered at load centers.

A second development is the proposal to add power features to the reactor under construction at the Hanford Engineering Works. Waste steam thereby could be utilized to generate power. The President's budget proposal is to construct two generators at the plant and to coordinate this power with the United States Columbia River power system. Power under the dual-purpose stage would cost about $13 per kilowatt-year at load centers and during the single-purpose stage it would be comparable in cost to alternative power sources. A power supply from Hanford would bridge the gap of 1964–65 and 1965–66 and enable the Bonneville Power Administration to immediately sell existing surplus power for industrial expansion. This surplus cannot be sold on a long-term basis at the present time because of a regional deficiency without the Hanford power in 1964–65.

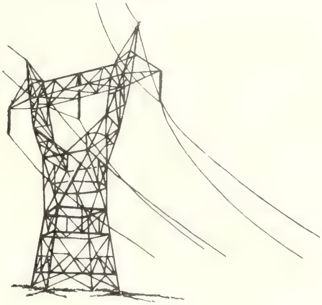
A third development is an investigation of a Pacific Northwest-Pacific Southwest extra-high voltage intertie. A five-man Task Force was appointed by the Secretary of the Interior, headed by Charles F. Luce, Administrator of the Bonneville Power Administration, and including H. P. Dugan of the Bureau of Reclamation at Sacramento, Calif.; M. A. Chase, an engineer in the Office of the Assistant Secretary for Water and Power; Morgan Dubrow and Bernard Goldhammer, both of the Bonneville Power Administration.

The Task Force is investigating the possibilities of an extra-high voltage intertie with the Pacific Southwest. Such an intertie would enable the Bonneville Power Administration to dispose of surplus secondary energy and possibly surplus peaking capacity. The intertie would also be useful in firming up capacity in the Pacific Northwest by import of off-peak energy from California. This year Bonneville had about $30 million worth of unused power, part of which could be utilized with such an intertie.

Bonneville offered 150,000 average kilowatts of firm power in May 1960, with the requirement of the purchase of at least an equal amount of secondary power for industrial expansion. Contracts were executed during fiscal year 1961 to supply power for the expansion of the aluminum plant at The Dalles, Oreg., for a new plant at Wauna, Oreg., and for a plant at Anaconda, Mont., which will produce steel and other minerals from a slag pile from the smelter there.

# *Southwestern Power Administration*

**Douglas G. Wright,** ***Administrator***



The Southwestern Power Administration is the Department of the Interior agency designated to market surplus electric power and energy generated at 14 water resource multiple-purpose reservoir projects of the Corps of Engineers in the Southwest, in accordance with the provisions of section 5 of the Flood Control Act of 1944.

Gross revenues for Southwestern Power Administration for fiscal year 1961 were $14,953,011.48.

During fiscal year 1961, sales to private utilities accounted for 31 percent of the revenue dollar, electric cooperatives 57 percent, municipalities 9 percent, and public authorities 3 percent, as compared with fiscal year 1951 when private utilities accounted for 82 percent, electric cooperatives 16 percent, municipalities 2 percent, and public authorities 0 percent.

As of June 30, 1961, the original cost of Southwestern Power Administration transmission facilities totalled $27,832,217.

## *Marketing*

During fiscal year 1961, Southwestern Power Administration, after making intensive studies of its customers' power needs, initiated changes and amendments to some contracts, and continued negotiations with certain of its major wholesale power customers for the purpose of effectuating more complete integration of its power system with the other power systems of the Southwest area.

The goal is to provide preference customers served by Southwestern Power Administration with a more satisfactory and economical source of power supply to serve the ever-increasing electrical power loads on their respective systems, while at the same time assuring maximum benefits to preference customers by the most effective marketing of hydroelectric power produced from the nine Federal multi-purpose projects now in operation, as well as that which will be produced from five such projects now under construction and scheduled for operation in the near future. In order to accomplish this goal, Southwestern Power Administration is continually studying its power marketing program in its effort to provide maximum use of such generating capacity.

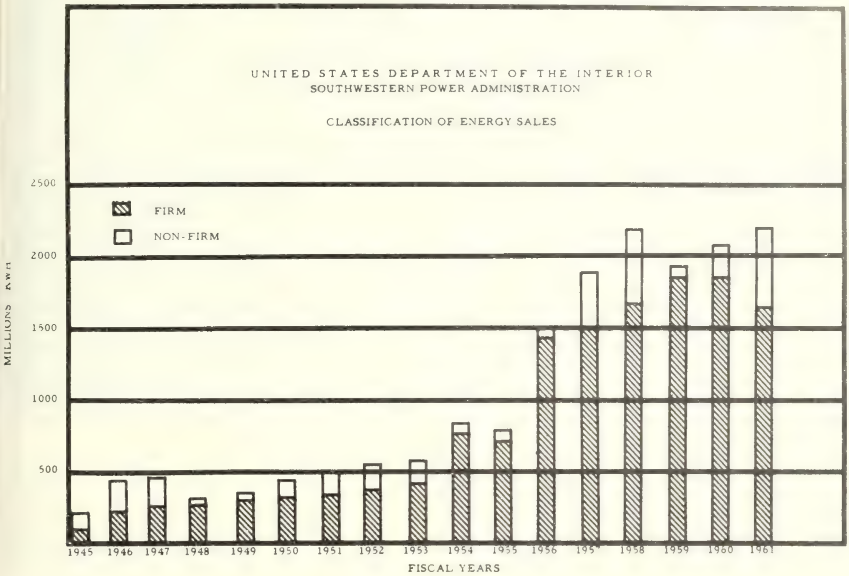
One major integrating arrangement, which will provide load center service to five REA electric distribution cooperatives in western and northern Arkansas, was accomplished during fiscal year 1961. This arrangement, effected through the contractual agreement of the Arkansas State Electric Cooperative, Inc., North Little Rock, Ark., the Southwest Electric Power Company, Shreveport, La., and Southwestern Power Administration, provides that SPA will be marketing peaking hydroelectric power in the amount of 25,000 kw in July 1964, 27,500 kw in July 1965 and will thereafter gradually increase this amount to the maximum of 62,000 kw in July 1970; the Arkansas State Electric Cooperative, Inc., will construct a 50,000 kw thermal plant near Ozark, Ark., scheduled for completion at the end of fiscal year 1962; and the result will be integrated operation of the power systems of Southwest Electric Power Company, Southwestern Power Administration, and the Cooperative.

A similar broad integration arrangement of the power systems in Missouri, initiated early in fiscal year 1961, is still being actively negotiated. This arrangement provides for the power systems of six G&T Cooperatives and three private utility companies in Missouri, to be integrated with Southwestern Power Administration for marketing power in that area.

### *Contracts*

Under the terms of the power marketing contracts accomplished during fiscal year 1961 with the Cities of Jonesboro, Arkansas, and Carthage, Missouri, Southwestern Power Administration will sell these municipalities blocks of peaking power, interruptible capacity, and dump energy.

Operations under these contracts will become effective upon the completion of (1) approximately 40 miles of 161 kv transmission line ow being constructed by Jonesboro for interconnection at a point ear Water Valley, Ark., with the Federal high voltage grid, and 2) approximately two miles of 69 kv transmission line being contructed by Carthage for interconnection at the Southwestern Power dministration's substation at Carthage, Mo. The scheduled dates or the completion of these transmission lines is in the spring of 962 for Jonesboro, and the summer of 1961 for Carthage.



## Sales

Southwestern Power Administration's electric power sales in fiscal year 1961 increased to 554,520 kilowatts from 545,405 kilowatts in fiscal year 1960, and to 2,196,367,916 kw.-hr. from 2,060,866,640 kw.-hr. in fiscal year 1960. The sales were made to 29 public bodies, 10 REA electric distribution cooperatives, 9 REA G&T cooperatives,[1] one industry (aluminum), and 7 private electric utilities.

The sales of kilowatt-hours of energy by class of customer during fiscal year 1961 were as follows:

| | *Fiscal year 1961 millions of kw.-hr.* |
|---|---|
| Municipalities | 192. 0 |
| REA electric cooperatives | 3, 310. 7 |
| Public authorities | 63. 3 |
| Defense industry (aluminum) | 505. 4 |
| Private electric utilities | 125. 0 |
| Total | 2, 196. 4 |

---

[1] Includes Tex-La Electric Cooperative.

## *Installed and Dependable Capacity*

The installed and dependable capacity and current capability in both the hydroelectric plants and the steam electric plants in Southwestern Power Administration's interconnected system are shown in the following table:

TABLE No. 1

| Project or plant | State | River basin | Installed capacity kilowatts | Dependable capacity kilowatts | Capability June 30, 1961 kilowatts |
|---|---|---|---|---|---|
| Hydroelectric interconnected system: | | | | | |
| Bull Shoals | Arkansas | White | 160,000 | 100,000 | 184,000 |
| Denison | Oklahoma-Texas | Red | 70,000 | 54,000 | 80,000 |
| Fort Gibson | Oklahoma | Grand | 45,000 | 45,000 | 48,000 |
| Norfork | Arkansas | White | 70,000 | 56,000 | 80,000 |
| Table Rock | Missouri | do | 100,000 | 69,000 | [1] 110,000 |
| Tenkiller Ferry | Oklahoma | Illinois | 34,000 | 28,000 | 39,000 |
| Subtotal | | | 479,000 | 352,000 | 541,000 |
| Isolated plants: | | | | | |
| Blakely Mountain | Arkansas | Ouachita | 75,000 | 75,000 | 75,000 |
| Narrows | do | Little Missouri | 17,000 | 14,000 | 19,000 |
| Whitney | Texas | Brazos | 30,000 | 24,000 | 29,000 |
| Subtotal | | | 122,000 | 113,000 | 123,000 |
| Total hydroelectric | | | 601,000 | 465,000 | 664,000 |
| Steam: | | | | | |
| Central Electric Power Coop. | Missouri | | 15,000 | 16,000 | 16,000 |
| N.W. Electric Power Coop. | do | | 40,000 | 42,000 | [2] 21,000 |
| Western Farmers Electric Coop. | Oklahoma | | 30,000 | 31,000 | 31,000 |
| Total steam | | | 85,000 | 89,000 | 68,000 |
| Grand total | | | 686,000 | 554,000 | 732,000 |

[1] Units 3 and 4 under test during June. Commercial operation of these units expected during July.
[2] One unit out of service for repair.

Mechanical difficulties and resultant overhaul kept both Unit No. 3 and No. 4 at Table Park project out of commercial operation, except for periods of testing, during a part of the fiscal year. With these two additional units in operation, the installed capacity of the interconnected hydroelectric system is 701,000 kilowatts.

Inflows into the reservoirs of the projects interconnected by the SPA transmission systems were greater than median for 8 months of fiscal year 1961, with average flow for the year being approximately 150 percent of median. Storage in the reservoir system was 96 percent of full pool at the beginning of the fiscal year, and was approximately 125 percent full on June 30, 1961, with flood storage in four of the six interconnected projects.

The total net hydroelectric generation of fiscal year 1961 was 1,987.2 million kilowatt-hours, which was almost equal to the maximum annual generation of the fiscal year 1957. The net generation from the

*Springfield dispatcher's office, Springfield, Mo., is the nerve center of SPA's electric transmission system in Missouri and Arkansas. Information regarding the power flow between the SPA system and other systems is telemetered into this office for use in automatic load control equipment.*

interconnected hydroelectric system amounted to 1,665.5 million kilowatt-hours.

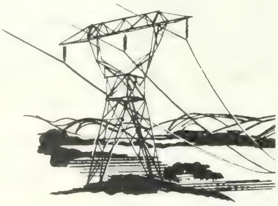
The amounts of energy generated by G&T thermal electric plants for marketing by Southwestern Power Administration during fiscal year 1961 are as follows:

| | *Kilowatt-hours* |
|---|---|
| Central Electric Power Cooperative (Chamois, Mo.) | 48, 094, 000 |
| N.W. Electric Power Cooperative (Missouri City, Mo.) | 111, 197, 000 |
| Western Farmers Electric Cooperative (Anadarko, Okla.) | 108, 063, 500 |
| Total thermal | 267, 354, 500 |

In addition to the generation from the hydroelectric and fuel electric plants whose output is marketed by SPA, energy was obtained from other sources in the amount of 102,370,188 kilowatt-hours for delivery to SPA customers during fiscal year 1961.

# *Southeastern Power Administration*

Chas. W. Leavy, *Administrator*



During Fiscal 1961, Southeastern Power Administration of the Department of the Interior marketed 1,263,400 kilowatts of capacity (with peak generation of 1,488,850 kilowatts) and 3,861,792,445 kilowatt-hours of energy. It was sold to 52 public bodies, 74 rural electric cooperatives, 1 Federal agency, and 5 privately-owned utilities.

Sales during the year earned $19,711,259.50, as compared with $20,650,668.97 for the previous year, bringing the revenue earned in all years to total $130,980,082.91.

The output was generated at 11 Corps of Engineers projects: Wolf Creek, Dale Hollow, Center Hill, Old Hickory, and Cheatham projects in Kentucky and Tennessee; Allatoona and Buford projects in Georgia; Clark Hill project in Georgia and South Carolina; Jim Woodruff project in Florida; and John H. Kerr and Philpott projects in Virginia.

The installed generating capacity of 1,283,600 kilowatts includes a 12,000 kilowatt unit which was placed in commercial operation at Cheatham project in Tennessee during the year. Construction by the Corps continued on three projects (Walter F: George in Georgia and Alabama, Hartwell in Georgia and South Carolina, and Barkley in Kentucky). The construction underway will add 524,000 kilowatts of installed capacity.

The combined output of Wolf Creek, Center Hill, and Dale Hollow projects continued to be sold to the Tennessee Valley Authority under a long-term contract. The entire output of the Old Hickory and Cheatham projects was sold under another long-term contract with TVA.

The Philpott project output was sold to the Appalachian Power ompany under temporary arrangements during a portion of the year ending the conclusion of negotiations for long-term sale. Under a ntract effective March 31, 1961, providing for the integrated opera- on of the Philpott and Kerr projects, the output of Philpott and two- irds of the Kerr project output were sold to the Virginia Electric nd Power Company and to 17 cooperatives in Virginia and North arolina; the remainder of the Kerr output continued to be sold nder long-term contracts to Carolina Power and Light Company, nd to 16 public bodies and cooperatives in North Carolina.

Part of the Clark Hill project output was sold under long-term ntracts to two public bodies in South Carolina. The one-half of e output of the Clark Hill project and the entire output of the llatoona and Buford projects were sold under long-term contracts Georgia Power Company and 86 public bodies and cooperatives in eorgia. The output of the Jim Woodruff project was sold under ng-term contracts to Florida Power Corporation and 6 public bodies nd cooperatives in Florida.

The Congress appropriated $280,000 for headquarters operations nd maintenance for fiscal year, and $520,000 for the purchase of rming energy and the payment of wheeling fees. Southeastern's orking force numbered 34 employees at the beginning of fiscal 1961 nd 33 employees when the year ended.

# *Office of Saline Water*

Charles F. MacGowan, ***Director***

On June 21, President Kennedy pressed a special magnesium button in his office in the White House to signal the start-up of the 1-million gallon per day saline water conversion demonstration plant a Freeport, Tex., the first demonstration plant in the Nation.

In his remarks, which were broadcast to the crowd assembled a Freeport for the ceremony, the President said: "This is a work which in many ways is more important than any other scientific enterpris in which this country is now engaged. It serves the interests of men and women every place. It can do more to raise men and women from lives of poverty and desperation than any other scientifi advance."

A bill was submitted near the end of the fiscal year to expand and extend the Saline Water Conversion Program. In his letter transmitting the draft bill to the Congress, the President said: "This bil will provide the Department of the Interior with a wide variety o tools to attack the saline water conversion cost barrier. It contemplates a major acceleration of current programs of basic and applied research, and permits the construction of conversion plants far larger than any now in existence to test the feasibility of known and yet t be developed processes."

The intense personal interest of the President has focused international attention on the activities of the Office of Saline Water. The Office is receiving an ever-increasing number of visitors and letters from foreign countries, especially those in the more arid areas of the world, seeking information on current developments. The Office of Saline Water is rapidly becoming the focal point and clearing house for most international efforts in this field.

## *Basic Research*

To maintain a successful research and development program, great emphasis must be placed on basic or fundamental research. Low cost saline water conversion has not yet been achieved and thus new ideas and new processes are needed which can result only from such basic studies.

To date the Saline Water Conversion Program has been primarily an engineering development effort with emphasis on basic hardware. Progress has been made but relatively little effort has been expended toward studying basic phenomena so necessary in developing new processes or improving existing ones. Hence, it was decided that a detailed technical review of the basic research activities in the general field of desalting be undertaken.

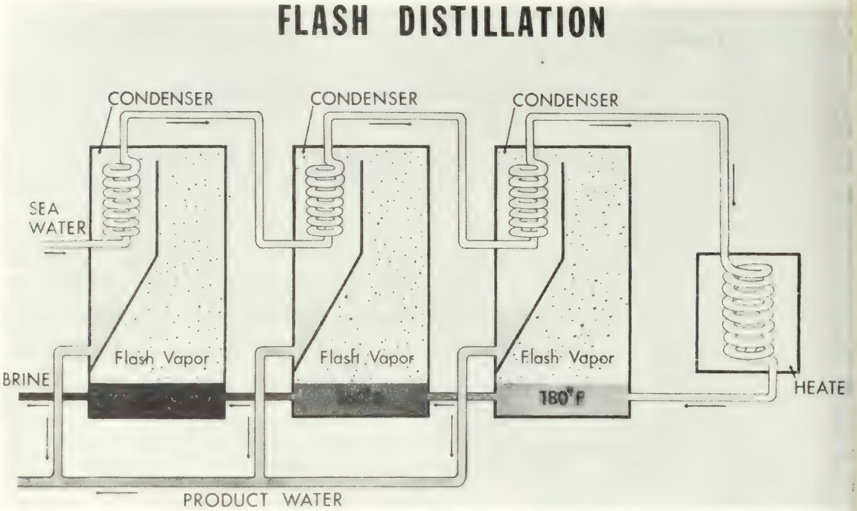
As a result, a review was organized and carried out by the National Academy of Sciences-National Research Council at Woods Hole, Mass., under a grant from the Office of Saline Water. Several senior scientists and engineers attended and participated in the review and several recommendations and suggestions were made relating to saline water conversion. It was established that a much broader basic research program would be highly desirable.

Current research includes laboratory and theoretical investigations on various new conversion processes, scale formation, membrane development (ion-selective and osmotic types), heat transfer, corrosion, use of radioisotopes, sea water conversion by-products, etc.

Studies are underway to determine the possibility of utilizing adioisotopes as a source of heat for various conversion processes. Preliminary results have indicated that certain calcined fission products may compete favorably with conventional fuels as an energy source. To date, the investigations have included detailed economic studies, operation analyses, design studies on the heat source, and a compatability study between the heat source and various saline water onversion processes.

One approach to resolving the scale problem is to remove the scale-forming elements in the pretreatment of raw sea water. Research s underway to determine the economic feasibility of preparing a high-analysis fertilizer from the elements removed in such a pretreatment and thus pay (all or partially) for this additional operation which would virtually eliminate the scale problem.

Work is continuing on the properties of gas hydrates. In the hydrate process, the water reacts with a hydrating agent to form a solid hydrate which can be separated from the salt solution (sea water). After separation, the hydrate is decomposed into the product water and the agent which can be recovered. This process is similar



*Schematic diagram of the process to be utilized in the 1 million gallons per da saline water conversion demonstration plant now under construction at San Dieg Calif.*

to the freezing process in many ways, however, due to the fact tha the various hydrates have different thermo-dynamic properties optimum operating conditions can be achieved by appropriate selection of the hydrating agent.

Basic research on the development of osmotic membranes (thos that reject salt but permit the passage of water) is progressing. Th current work has two principle objectives: One is to determine th molecular characteristic of the Polymer films (membranes) that wil insure prolonged high transmission rate of water and negligibl transmission of salts. The other is to prepare films having thes superior transmission characteristics and good durability.

Studies on mechanisms of scale formation, use of acoustic vibration to improve heat transfer in distillation units, corrosion of constructio materials by sea water, and electrochemical demineralization of wate with carbon electrodes of large surface area are showing considerabl progress.

## *Processes Development*

Applied research activities continued on many conversion problem with development emphasis being on processes in the major group of distillation, membrane, separation by freezing and other chemical electrical or physical conversion methods.

Several distillation processes are the farthest advanced with multiple stage flash distillation and very recently, the long tube vertical multiple effect distillation receiving increasing attention for commercial use in converting sea water.

However, research and development on distillation processes has continued both in the investigation of new systems and in improvements of processes now in use by such means as developing better methods of scale control. For example, the pilot equipment used in developing the LTV process in the first demonstration plant has continued operation in order to develop better means of controlling calcium sulphate scale. The systems based on the development of wiped film evaporator have advanced to the building of a 1,000 gallons per day prototype unit for Naval use.

New research studies were initiated on the prevention of scale by application of sludge recirculation techniques to multiple stage flash evaporation. Also, the equipment was used to investigate means of preventing scale formation in the vapor compression forced-circulation demonstration plant which will be built at Roswell, N. Mex. In that connection, the assistance of the Corps of Engineers was obtained in operating experimental units in the field at the Roswell site. The vapor reheat process in which there are no metallic heat transfer barriers advanced closer to pilot plant development. The freezing process will be demonstrated in a 250,000 gallons per day plant at Wrightsville Beach, N.C.

At the present, there are two different freezing processes being investigated under contract to this Office at the pilot plant level. The first of these is a 15,000 gallons per day pilot plant which utilizes the principle of flash evaporation of precooled sea water with the subsequent absorption of the water vapor by a chemical absorbent. The resulting ice is separated from the saline liquor and washed free of adhering salt and then melted by utilizing the heat of absorption. The technical feasibility of this process has been demonstrated by a 300 hour continuous run. The initial operation of this plant was started at Syracuse, N.Y., near the contractor's facilites, so that modifications to the unit if needed, could be made conveniently during the initial stages. The plant was then moved to the present location, Wrightsville Beach, N.C., for further evaluation.

Operation of the second pilot plant was started at St. Petersburg, Fla. This is a 35,000 gallons per day unit in which precooled sea water is frozen by flashing a hydrocarbon refrigerant (butane) in direct contact with the feed stream. The ice crystals are washed free of salt and melted by condensation of the refrigerant vapor.

Progress has been made in the above described pilot plant operations. However, it was found that additional data and modified design were needed in order to obtain satisfactory extrapolation of design to large size freezing conversion plants. These additiona studies are now in progress. Further research is also being conducted on crystal growth and ice washing techniques.

The emphasis on the development of membrane processes has continued to be place on electrodialysis which is most important in th conversion of brackish waters. The greatest effort in this field ha been in the development program being supported by the Office o Saline Water at the Bureau of Reclamation Laboratories in Denver Scientific and engineering personnel are gaining experience on electrodialysis..

In a related area, at the request of the Israeli Council of Research and Development, an engineer was sent to the Negev Institute for Arid Zone Research in Beersheba, Israel, for consultation in connection with the electrodialysis program. Five different commercia units have been obtained and are being evaluated in the Denver Laboratory. During the year, a field test site was made available near Denver for further evaluation of electrodialysis equipment on brackish well waters.

In a related area, the ion exchange field, favorable results have been obtained in the operation of a pilot unit in preventing calcium sulphate scale formation in sea water evaporators by ion exchange softening using the concentrated waste brine from the evaporator to regenerate the resin. A pilot plant unit has been operating at Freeport, Tex. This new technique may be applicable to the process of forced circulation vapor compression distillation to be used by the Roswell brackish water demonstration plant.

The operation of experimental types of solar stills at the Daytona Beach, Florida site resulted in the design and installation of an improved type of basin solar still which uses only concrete, glass, and asphalt in its construction. Simplification of design of this 3,000-square-foot still gave a major reduction in the cost per square foot The materials used were expected to give very long life with minimum maintenance. Test operation of the new still began in June. Other smaller solar type stills are also being evaluated.

Initial research results on the new chemical processes based upon the use of propane hydrates were favorable. Accordingly, the development effort has been expanded, and it is expected that during the next year pilot plant development will be started.

In the processes development activities, 28 applied research contracts were current during the year and 13 technical reports were published.

Towards the end of the year, preliminary plans were being made for installation of a pilot plant test facility at a site at Wrightsville

*ndon B. Johnson, Vice President of the United States, dedicating the Nation's t saline water conversion demonstration plant in Freeport, Tex. In the left eground are Secretary of the Interior Stewart L. Udall and Senator Clinton P. derson of New Mexico, Chairman of the Senate Committee on Interior and ular Affairs.*

each, N.C., made available by the State of North Carolina and being de suitable for use by the State.

### *emonstration Plants*

Five sites have been selected and five processes programmed for monstration plant testing. They are as follows:

- Long tube vertical multiple-effect distillation, Freeport, Tex.
- Multistage flash distillation, San Diego, Calif.
- Electrodialysis, Webster, S. Dak.
- Forced-circulation vapor-compression, Roswell, N. Mex.
- Freeze demineralization, Wrightsville Beach, N.C.

The Chicago Bridge & Iron Co. completed construction of the Free- rt, Tex., saline water conversion demonstration plant on May 7, 1961.

Following several weeks of initial test operations the plant wa placed in full production on June 21.

The Freeport plant represents a number of significant "firsts" i the field of saline water conversion. It is the first sea water conversio plant in the United States capable of producing 1 million gallon of fresh water per day—the first sea water conversion plant to regularl supply the water needs of a U.S. municipality; the first sea water conversion plant to use 12 evaporators in an integrated operation and firs to operate at temperatures up to 250° F.

Based on the data obtained thus far from the operation of the plant the cost of the product water is $1–$1.25 per 1,000 gallons including 20 year amortization charges.

### *Freeport Process*

In the long-tube vertical multiple effect distillation system utilize in the Freeport plant, sea water falls through bundles of 2-inc tubes in a series of evaporators under progressively reduced pressure In the first evaporator, steam around the outside of the tube bundl causes part of the sea water to boil as it falls through the tubes Emerging at the bottom of the evaporator, then, is a mixture of vapo and hot brine.

The hot brine is pumped to the top of the second evaporator wher under slightly reduced pressure it again falls through the inside o the tubes. The vapor produced in the first effect flows to the outsid of the tube bundle in the second effect. Here the vapor is condense to fresh water by giving up its latent heat to the sea water fallin through the tubes which again causes part of the water in the tubes t boil. The same process is repeated through all 12 effects to the plant

A $1,608,000 construction contract for a 1-million gallons per da plant at San Diego, Calif., was awarded to Westinghouse Electri Corporation on November 5, 1960. On November 16, 1960, a $482,20 construction contract was awarded to Asahi Chemical Industry Company, Ltd. for the 250,000 gallons per day electrodialysis process demonstration plant to demineralize the brackish well water at Webster, S. Dak. Considerable progress has been made toward the completion of these plants by the end of this fiscal year.

A contract for the architect and engineering services for the Roswell, N. Mex., plant was awarded to the Catalytic Construction Company of Philadelphia, Pa.; and a similar contract was awarded to the Lummus Company of New York City for the Wrightsville Beach, N.C. plant. It is anticipated that construction of those plants will start during fiscal 1962.

# Office of the Assistant Secretary
# *Mineral Resources*

John M. Kelly, *Assistant Secretary*

The Assistant Secretary for Mineral Resources discharges the responsibilities of the Secretary of the Interior with respect to the Department's programs in the field of the development and utilization of minerals and metals, including mineral fuels. He exercises supervision over the Geological Survey, the Bureau of Mines, the Office of Minerals Exploration, the Office of Oil and Gas, the Office of Minerals Mobilization, the Office of Geography, the Oil Import Administration, and the Office of Coal Research.

The Assistant Secretary serves as the principal spokesman for the Department of the Interior at the policy-making level within the Federal Government for matters relating to minerals and fuels, and is a focal point within the Government for contacts respecting minerals and fuels with Congress and the public.

Petroleum and petroleum related problems continued to occupy much of the time and attention of the Assistant Secretary and of the staff. Emphasis during the fiscal year was placed increasingly upon improving the national security posture of the United States with respect to petroleum planning and to developing positions for use of the United States in its contacts with the petroleum mobilization planning bodies of other nations.

The Office actively participated in the formulation of new policies relating to the Oil Import Administration. During the year, a major revision of the import program as it relates to residual fuel oil imported for use as fuel was developed. Public hearings were conducted and a review initiated with respect to the crude oil aspects of the import program.

The Office participated extensively in discussions within the Administration and with members of the Congress relating to measures for relief of the depressed segments of the domestic mining industry. These discussions culminated in development of a series of proposals which, if finally approved, will measurably improve the position of domestic mines.

The Office maintained its leading role in the United States' participation in the International Lead-Zinc Study Group. Representatives of the office attended meetings in Geneva, Switzerland, in September 1960 and Mexico City in March 1961. The Office supplied representatives to a meeting in New York in June 1961 of a Working Committee established by the Study Group to explore the possibility of developing a commodity agreement for lead and zinc.

The Office continued to take an active part in decisions relating to stockpile acquisitions and disposal, and maintained its interest in advising the Department of Agriculture with respect to acquisition of strategic and critical materials for the supplemental stockpile through barter transactions.

In this connection, the Office was the principal point of coordination in the negotiations relating to the development of a program to remove surpluses of lead outside of the United States now overhanging the market and thereby pave the way for a general improvement in the balance of supply versus demand of this commodity.

The Office devoted much time and attention to developing the organization, and Administrative and operational guidelines, of the newly created Office of Coal Research. By the end of the period staffing had been substantially completed and the way was cleared for the Office to begin to evaluate proposals and enter into contracts for coal-related research projects.

At the end of the fiscal year, the Office was in the process of developing revisions to the program of Federal financial assistance to exploration activities administered by the Office of Minerals Exploration. The revisions will broaden coverage of the program, and strengthen its operations.

# *Geological Survey*

**Thomas B. Nolan,** ***Director***

Water and Minerals—two of the resources constituting the Nation's basic wealth are prime responsibilities of the Geological Survey of the Department of the Interior. Ever since this bureau was established in 1879 following recommendations of the National Academy of Sciences, its scientists and engineers have studied the country's mineral and water resources and have constantly added to the fund of knowledge to be drawn upon in the solution of problems nherent in the expansion of the economy of the Nation. Its findings give backbone to textbooks, bolster conservation, pave the way for community development, and provide national sinews.

Through land classification activities, the Survey seeks out dam sites and potential mineral and fuel deposits for public benefit, meanwhile supervising constructive exploitation and adding royalty monies collected to State and National treasuries.

Topographic and geologic mapping provide orientation for orderly national or local planning. This is an essential element in urban and industrial economic growth—a valuable concomitant in providing living space during the current population explosion. Topographically, approximately half the United States is adequately mapped today, and steady progress is being made toward complete coverage. An important step in this direction was the 3-year program recently started by Ohio for Statewide map coverage at 1:24,000-scale.

Better understanding of the geochemical, geophysical, and geologic processes involved in the formation and localization of ore is essential to the improvement of prospecting techniques. The proper coordination of laboratory and field operations help delineate the most likely places to search for new or additional minerals and mineral fuels.

*Volcanology studies by the Geological Survey are conducted principally in Hawaii— scene of active volcano displays such as pictured above. Besides acting as a "civi warning" station, basic purpose is to provide scientific data on the earth's mysteries*

Such work is especially important to the critical task of finding or deposits that are masked by overburden.

## *Minerals Exploration*

A newly opened window on the future is afforded by present day geochemical and geophysical explorations constituting part of the long-range minerals program. New data are being sought on the physical properties of rocks, on the nature of ore-forming fluids, and on the physical, chemical and biochemical changes that take place as a result of natural weathering.

Such increased knowledge of geologic processes is finding applications in many fields. A research program now underway at the Hawaiian Volcano Observatory provides new understanding of some of the phenomena involved in the formation of ore deposits. It also provides for immediate application some of the geophysical measurements whereby a volcano's potential eruption cycles can be predicted.

## *Geologic Division*

In its long-range programs investigating and appraising the Nation's mineral resources and applying geologic knowledge to serve national interests, the Geologic Division of the Survey is conducting a wide variety of research operations in many fields.

Investigations range from studies of the structure of continents to studies of the subatomic structure of minerals, of areas close to the North Pole to some within 200 miles of the South Pole, of samples obtained from below the crust of a congealing lava pond formed during a volcanic eruption to materials that have been frozen for long periods of time, and from studies in well-equipped laboratories to work in areas where the only access is by pack train or helicopter.

Such investigations can be grouped into three general categories: studies in economic geology, in regional geology, and in geologic processes and principles. Some are carried out on behalf of other Federal agencies, including the Defense Department, Atomic Energy Commission, National Science Foundation, International Cooperation Administration, Bureau of Public Roads, and the Department's Bureau of Mines and Office of Minerals Exploration.

Others were in progress in cooperation with 17 States, Puerto Rico, Los Angeles County, and the City of Seattle. Of outstanding importance is a 10-year program to map in detail the geology of the entire State of Kentucky which was started during the year.

### *Geologic Publications*

Results of the Division's investigations were published in 93 professional papers and bulletins, 77 maps, and some 250 technical papers in scientific journals. An additional 92 reports were made available in files open for public reference. A synopsis of research during the year ending June 30, 1960, was published in October as Professional Paper 400–A, entitled "Geological Survey Research, 1960." A companion volume of 232 short papers summarizing results of individual investigations was published at the same time as Professional Paper 400–B.

### *Economic Geology*

Economic geology investigations include both field mapping and topical (resource) studies in areas known or believed to contain minerals or mineral fuels of present or potential value (1) to establish guides useful in the search for concealed deposits; (2) to define favorable areas for exploration; and (3) to appraise the resources.

Other studies are concerned with the preparation on a nationa basis of estimates of the quantity of resources and with the synthesi of data to help define areas favorable for exploration. Still other are designed to provide geologic information applicable to the solution of engineering problems, such as construction of dams, roads public buildings, earthquake damage, landslides, and erosion. In the field of public health and safety, geologic guides are being use in studies of mine drainage, in the disposal of radioactive waste, an in studying the effect of the distribution of certain elements on publi health.

Highlights of some of these investigations are summarized below

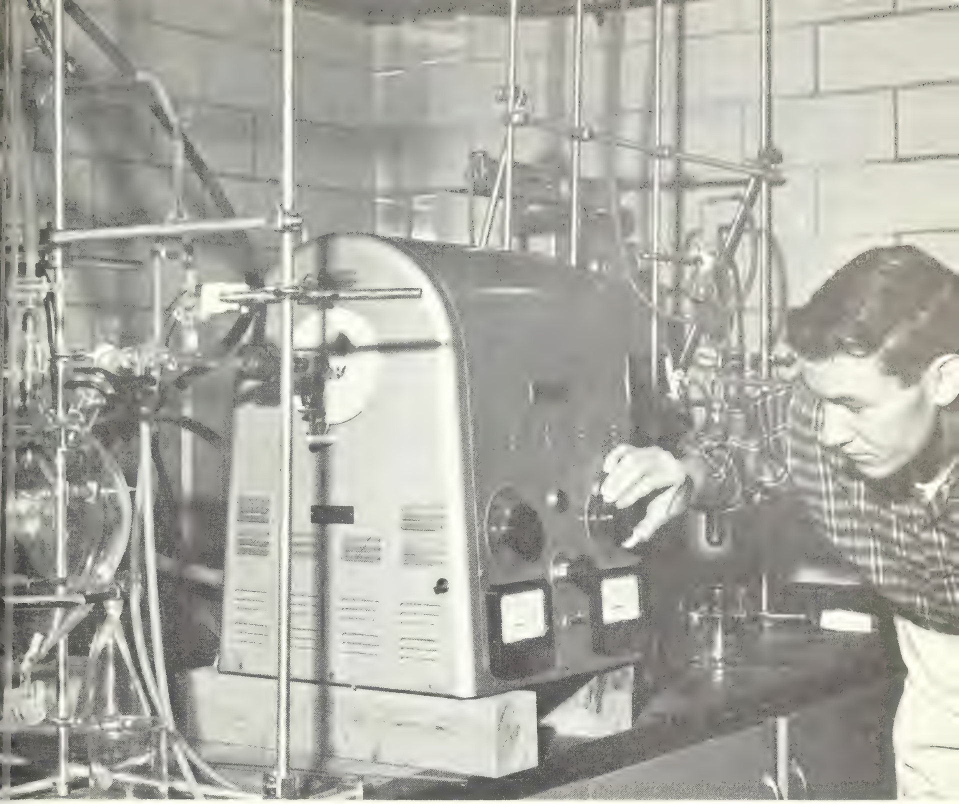
Structural information and other geologic data published by th Geological Survey were the basis for exploration by private industr that extended the area of known zinc-silver-lead ores in the Eas Tintic, Utah, mining district. Survey work also contributed to th definition of a major potential source of molybdenum at Questa N. Mex., through a federally assisted exploration project of a mining company and the Department's Office of Minerals Exploration.

### *Geochemistry Aids Exploration for Minerals*

Geochemical prospecting near Pima, Ariz., indicates that broa halos surround large deposits of molybdenum and copper. Thes halos form prospecting targets as much as 2 miles from know deposits of copper and more than 8 miles from known deposits o molybdenum. In Nevada, geochemical abnormalities in an area o complex faulting may represent leakage halos of ore deposits in o below the thrust plane. In Somerset County, Me., geochemical sampling has indicated two areas that contain abnormal amounts of coppe and has led to discovery of a quartz vein containing appreciabl amounts of galena.

Sources of beryllium are being studied in different geologic environments: at Spors Mountain, Utah, where the beryllium minerals ar in volcanic rocks; at Wheeler Peak, Nev., where they replace limestone near an intrusion; at Lake George, Colo., where they are associated with granitic and metamorphic rocks; and on the Sewar Peninsula, Alaska, where they occur with tin and tungsten in veins A simple "contact-printing" method of testing the rocks to distinguis the beryllium-bearing ore mineral, bertrandite, from quartz, has bee developed, and a sensitive probe has been designed to log the distribution of beryllium minerals in drill-holes.

Indications are that germanium, now recovered mainly as a by-product of zinc smelters, possibly can be recovered also from coppe



*onsiderable apparatus is needed for the complicated studies of carbonate rocks determine at what temperature they were formed in nature.*

nelters. Analyses indicate copper sulfide-bearing minerals contain ore germanium than does sphalerite, the principal zinc-bearing sulde mineral.

## *ew Guides to Selective Mining*

Recognition of significant differences in the chromium and iron ontent of chromite from the Stillwater area, Montana, within layers f massive chromitite, and between adjacent layers of massive chroitite and olivine-bearing chromite, will provide guides for selective ining of higher grade layers.

Nearly all sandstones that contain uranium deposits that are the hief source of domestic uranium ores, were found to be deposited n a continental sedimentary environment, thus indicating that aditional deposits would more likely be found in sandstones accumuated in closed basins or fault-block valleys than in marine strata.

Geologic and geophysical data on the Atlantic coastal plain and ontinental shelf indicate a very large volume of sedimentary rocks hat constitute a potential petroleum-bearing area. Oil shales of the Green River formation have potential reserves of more than 50 billion barrels of oil in an area of about 700 square miles in southeastern Uinta Basin, Utah, and about 20 billion barrels in an area of 500 square miles in one member alone of the Firehole Basin area, Wyoming.

## *New Map of U.S. Coal Fields*

A newly revised map of the coal fields of the United States has been published in two sheets, Sheet 1 for the conterminous United States and Sheet 2 for Alaska. An appraisal of the coal resources of Arkansas increases by 70 percent the estimates made about 50 years ago, and indicates reserves total more than 2 billion tons of low-volatile bituminous coal and semianthracite. Reserves for Washington are conservatively estimated to be 6 billion tons, most of which is semibituminous and some of which has coking qualities.

## *Geology Aids Engineering*

A better understanding of the geologic causes of landslides and other mass movements of rocks has permitted the development of better zoning regulations by officials of several metropolitan areas. Use of geologic data in planning major construction and land development projects has reduced costs and hazards, and increased safety.

Engineering geology studies have also been carried out on behalf of the Atomic Energy Commission in the selection of sites for underground nuclear tests, evaluation of effects during and after explosions, and for the prediction of effects in proposed high-explosive and nuclear tests. Data on the structure and composition of the earth's crust and upper mantle are also obtained from the studies.

Also on behalf of the Atomic Energy Commission, investigations are being made to determine safe disposal methods for radioactive wastes. These range from studies of minerals such as crandallite that show specific ability to combine with or otherwise retain high-level radioactive waste products, to studies of large areas containing deep basins of sedimentary rocks that may provide suitable sites for deep underground storage of low-level waste products.

A study started at the suggestion of the National Cancer Institute indicates that vegetation growing near highways in Washington County, Md., and near Denver, Colo., contains a markedly higher lead content than similar vegetation at greater distances from the roads.

*eologists of the Survey use small portable core drills in collecting unweathered ck samples for geochemical analysis.*

## *egional Geology*

Geologic maps that depict the composition, structure, history and igin of the rocks that form the earth's crust are being prepared for any parts of the United States. These studies, supplemented by eophysical, geochemical, stratigraphic, and paleontologic investiga-ons provide the basic data to guide the search for useful earth aterials and the appraisal of potential uses of the areas studied. hey are especially useful in industrial and civil planning.

The work is broadly dispersed to provide data on as many facets geology as possible. As a result of some of these studies, a better understanding of much of the volcanic terrane in the southern Rocky Mountains is beginning to emerge from detailed mapping of the very large volumes of welded tuffs in that region, and several caldera structures in Colorado and New Mexico have been identified as sources of this ancient explosive volcanism. Some of these calderas are associated with mineral districts.

## *Broad Studies for Resource Development*

Studies of the former extent of glaciation along the Ohio River valley and geophysical studies of buried stream valleys in Ohio have furnished data useful to water resource development. Studies of ancient Lake Bonneville, ancestor of the present Great Salt Lake in Utah, indicate that the region has probably been uplifted as much as 210 feet since the glaciers retreated. This rebound is 70 percent of the theoretical maximum. Study of the progressive distribution of fossils and living species of freshwater clams indicates that the ancestral drainage of the Snake River, now a major tributary of the Columbia flowed southward through a chain of basins and did not join the Columbia drainage until recent geologic time.

Studies in Puerto Rico, the Canal Zone, and the islands of the western Pacific provide data on the development of the Panama land bridge, which came into existence during Pliocene time, and of the Pacific basin. Studies in Antarctica indicate that the White Continent has a framework similar to that of other comparable land masses A broad shield of Precambrian metamorphic and igneous rocks is adjoined by a broad terrane of Paleozoic sedimentary rocks that accumulated in a geosyncline. The Palmer Peninsula is a tectonic belt of Cretaceous and younger rocks comparable to and perhaps associated with the development of the Andes. Paleozoic rocks were deformed and intruded by igneous rocks in a series of events that progressed away from the shield toward the Palmer Peninsula. Geologic mapping has been started in the eastern Horlick Mountains, in our first attempt to acquire systematic coverage for an appreciable area south of the Antarctic Circle.

## *Geologic Processes*

Research in economic and regional geology must be founded on knowledge of natural processes within the earth, knowledge that is sought through research in both theoretical and practical aspects of all the related earth sciences, such as paleontology, geomorphology, geophysics, geochemistry, mineralogy, petrology and isotope geology

*Survey geologists use small portable core drills to reach below the surface and gather unweathered rock samples for geochemical analysis.*

Study of past and present geomorphic processes may supply suggestions on remedial measures to protect, preserve, and conserve ou natural assets. For example, the scenic cliff at Gay Head, Mass., ha retreated at the rate of 4,000 feet in 3,000 years, but information o the mechanics of erosion suggests that further accelerated erosio could be decreased by draining the swamps behind the cliff and b protecting the base of the cliff with rip-rap.

## *Geologic Aspects of Project Chariot*

Measurements in a deep drill hole along the Alaskan coast of the Chukchi Sea indicate that frozen ground stretches down some 1,20 feet below the surface and extends out beneath the sea. These data also indicate that the mean annual temperature has increased gradually during the last 60 to 80 years, and that the sea is gradually encroaching on the land.

Two important indicators of changes associated with rapidly applied large stresses, such as meteor impact and large explosions, have been studied. The mineral coesite, first identified in high-pressure laboratory experiments, has been found in shattered rocks at four natural meteor craters and at one crater formed by nuclear explosion. Shock-induced changes have also affected the thermoluminescent properties of rocks both in rock debris associated with large craters and in rocks used in high-velocity impact studies in the laboratory.

## *Drilling Yields Magnetic Data*

Studies of past changes in the earth's magnetic field show that the latest reversal of the field occurred about a million years ago. This change may ultimately furnish a very distinct, worldwide marker horizon.

Drill-hole logging devices to determine in-place acoustic properties and density, as well as electrical properties and magnetic susceptibility, are being used to supplement geophysical observations obtained at and above the surface. Such multiple data generally permit better identification of the rocks and structures penetrated by drill holes.

New extremely sensitive seismic equipment has been designed and constructed for the Survey to be used in a project conducted in behalf of the Department of Defense. This equipment will aid in obtaining more reliable and detailed knowledge of the structure of the earth, and in accurate determination of epicenters of earthquakes and man-made explosions. It has successfully recorded the effects of a 400-pound charge at a distance of 94 kilometers. Development of portable iltmeters has aided scientists at the Hawaiian Volcano Observatory in redicting volcanic activity, as the volcano undergoes measurable welling prior to eruption.

## *Iow Ores Are Formed*

Studies in mineralogy, petrology and geochemistry probe the chem-cal and physical properties of minerals, and indicate the conditions nder which rocks and minerals are formed. Data of the minor ele-nent and rare earth content of rock-forming minerals have direct se in the search for sources of many newly useful materials. Labo-atory studies of the progressive development of different kinds of ock from molten material of the same initial composition through lifferent cooling histories have aided in understanding how such videly different rocks as basalt and rhyolite can be produced at dif-erent times from a single volcanic center.

In a sequence in the Jemez Mountains, N.M., for example, succes-ive rock types are progressively enriched in some components, cul-ninating in the rhyolitic phase in which volatile materials are notably oncentrated. Under some conditions, explosive release of these vola-iles produces a succession of ash-falls and voluminous ash-flows vhich may become welded tuffs. Upon depletion of volatiles, viscous, as-poor flows or domes are extruded.

## *Mineralization Changes*

Studies in metamorphic processes develop information on index minerals that indicate pressure and temperature conditions at the time he rocks formed. For example, the zeolites (hydrous silicates of aluminum) are indicators of low-grade metamorphism and glau-ophane is an indicator of high pressure but low temperature metamorphism. Variations in the chemical composition of the sedimentary rocks provide data on the geochemical balance between source areas supplying the sediments and the environment in which the sediments were deposited. Locally derived components may be determined as well as the probable source of other components. For example, most of the sodium in thick trona (sodium carbonate) deposits in the Green River formation of Wyoming and neighboring areas was probably derived by weathering and erosion of the adjacent mountains.

As an example of the unexpected dividends of basic research, the design for a biochemical fuel cell has resulted from a study of the geochemical balance between bacteria and their environment. In the course of this study an electrical potential was observed to result fro bacterial action on aquatic organic wastes. A simple model was d signed consisting of a small cell containing bacteria and algae in sali solutions. It is believed to be capable of producing electricity i definitely, using only solar energy to sustain growth of the algae.

## *Geochronology Studies*

Marine sediments deposited in about the last 200,000 years can no be dated by measuring the relative abundance of thorium 230 an protactinium 231 formed in the radioactive decay of uraniu precipitated from seawater. This method appreciably extends th range of more precise geochronologic studies of the Pleistocene, whic had been limited to the last 30 to 40 thousand years by use of th carbon 14 method.

Survey scientists participated in the preliminary planning and tes drilling for the National Academy of Sciences-National Researc Council "Mohole" project, and now are studying samples and measurements obtained in these highly successful tests. In other studie of the suboceanic floor off southern California, aeromagnetic dat indicate several linear magnetic features that parallel structural trend of the Peninsular Range. Studies of the Aleutian Trench and sea between Alaska and Hawaii, in collaboration with the Navy Hydrographic Office and the Coast and Geodetic Survey, are obtaining bottom samples and geophysical measurements at sea as well as geophysical data on the Aleutian Islands.

## *Methods for Rapid Rock Analysis*

In laboratory research, new methods are providing faster and mor accurate chemical analyses for the large number of samples obtaine in all studies. Procedures for making rapid analyses of silicate rock in use for several years were augmented by rapid-method analytica procedures for carbonate rocks and phosphate rocks. Today, rapi analyses are possible for all major rock types.

Analytical procedures for high-accuracy rock and mineral analyse have been extensively revised to combine conventional wet chemical separations with appropriate spectrographic and spectrophotometri techniques. In spectrographic techniques, a promising start has bee made in developing direct-reading analytical procedures. Direct measurement by phototube of selected lines of the spectra is used to determine the amount of the element being analyzed. The technique was successfully tested in a study of about 180 samples containing beryllium. A simple direct determination of the beryllium content of ores and rocks without the necessity of separation has been developed using fluorescent morin and a fluorometric procedure.

In the study of very small volumes of rocks and minerals, an electron probe method developed last year has been successfully used to analyze small metallic spherules contained in tektites, enigmatic glassy rocks presumably meteoritic in origin, and to study minute inclusions in the spherules. Spherules, mainly iron with a little nickel, are a few tenths of a millimeter in diameter. The inclusions, tentatively identified as iron phosphide, measure about 1 to 5 microns (thousandths of a millimeter) in diameter. In other studies of zoning in minerals, the electron probe detected and analyzed zones as small as 2 to 4 microns in width.

### *Foreign Geology*

Technical assistance to foreign governments is primarily designed to aid the development of their economies through better understanding of their natural resources. This program under auspices of the International Cooperation Administration includes the training, advisory and service functions of 59 Geologic Division scientists working in cooperation with their host country counterparts in 13 nations, sharing advances in methods and techniques of geologic research and investigations; and the training in this country of some 137 earth scientists and technicians from 41 countries.

During the year, a training and advisory service program was begun in Bolivia; a mineral exploration and development program was begun in Pakistan to supplement an advisory and service program; and a 10-year advisory and training program in India was concluded. Technical aid was supplied to the disaster area in Chile following major earthquakes last year, to assist in developing plans for rebuilding in the affected area.

## *Conservation Division*

The principal tasks of the Survey's Conservation Division are to classify Federal lands as to mineral and water resources and supervise mineral recovery under leases, permits, and licenses on Federal, Indian, and Naval petroleum reserve lands. A headquarters staff and a field staff of geologists and engineers make surveys, maps, and reports dealing with water power, fuels, minerals, and chemicals essential to the economy of the United States; supervise mining and

*Scores of technical personnel, trainees and public officials from abroad receiv on-the-job training from Geological Survey scientists and engineers each yea through sponsorship by International Cooperation Administration.*

drilling operations to assure safe and economical production by private enterprise of coal, oil, gas, and other minerals; and supervis operations of the Federal Petroleum Board.

## *Mineral Classification*

During fiscal year 1961, the Geological Survey processed a total o 29,631 applications involving the use or disposition of Federal lands This included 6,857 requests involving outright disposal with no reservation of minerals or with the reservation of one or more specifie minerals, and 21,152 applications under Federal leasing laws involving the right of private enterprise to lease Federal lands for th extraction of minerals.

Initial or revised definitions of 304 producing oil and gas field were made affecting Federal leaseholds; 182 reports were drawn u on the mineral potentialities of specific lands for various agencies o the Federal Government; and 634 miscellaneous reports were made i connection with activities on Federal lands involving unit plans participating areas, productive limits, and associated matters

Geologists from field offices throughout the West also made investigations and produced reports and maps as needed to assist engineers in planning development and in administering Federal leases.

## *Public Lands Classification*

In the course of classifying public lands, approximately 1,300 square miles of preliminary mapping was completed and investigations are well along on large areas in the San Juan and Permian Basins, N. Mex. Geologic reports and maps have been completed for the Paradise quadrangle in Utah and important phosphate lands have been classified. Following review, five petroleum withdrawals were revoked involving about 85,500 acres.

Maps or reports were completed on the following fields or areas:

| *Structure maps* | *Reports* | *Geologic maps* |
|---|---|---|
| Southeastern San Juan Co., Utah.<br>Roxie oil and gas field, Franklin Co., Miss.<br>Cross-sections of Paradox Basin.<br>Cheyenne oil field, Major Co., Okla. | Holter Sandstone Member of the Marias River Shale, Colorado Group, Mont.<br>Stratigraphy of the saline facies of the Paradox Member of the Hermosa Formation of southeastern Utah and southwestern Colorado.<br>Geology of the Northeast Rangely coal area, Colo.<br>Review of the classification of the Salton Sea area, Calif. | Configuration of basement rocks in the north half of California.<br>Revision of maps showing areas of prospective value for oil and gas for several States.<br>Maps for sodium, potash and asphaltic minerals. |

In connection with damsite investigations, a geologic reconnaissance was made on the Trask and Siletz Rivers, Oreg., and on the Smith River, Calif. In Alaska, geologic reconnaissances were made of the Kashwitna Valley, Sheep River and Talkeetna River damsites, and a revised report was completed on the geology of the Bradley River damsite, Kenai Peninsula.

## *Waterpower*

Investigations were conducted in Alaska, California, Idaho, Oregon, Montana, and Washington during the year to determine the waterpower and storage possibilities of streams and lakes on public lands. Nine sets of river survey maps were published covering 345 miles of stream channel and 10 damsites. Four reports on waterpower resources were submitted for publication and three on the geology of waterpower sites. Four others on waterpower resource one on geology of waterpower sites, and two on the review of wate power withdrawals were made available for public reference.

Work was continued on the systematic review of all land withdrawals for waterpower and storage purposes and on the preparatio of required reports. During the year, 6 reports were prepared coverin 256,000 acres. Thus far in this program, 41 reports have been prepared for a total of 776,000 acres. About 40 percent of the withdrawn area is being recommended for restoration to entry becaus studies indicate these lands do not have sufficient water power o storage value to justify their retention in a reserve status. Land withdrawn in powersite reserves total 7,213,091 acres. Lands i reservoir site reserves total 130,981 acres.

Two hundred reports were prepared and submitted to the Department's Bureau of Land Management on the waterpower value o lands affected in applications for rights-of-way and 6,900 reports wer made on applications for land acquisition. Thirty-seven were submitted on applications to the Federal Power Commission for permit or license and 52 on applications for restoration of lands in powersit withdrawals.

## *Mining*

Supervisory control is exercised by the Survey over mining activities concerned with prospecting, development, and production of minerals under permits and leases.

Permits and leases issued under applicable laws and regulations involve operations on public lands for coal, potassium, sodium, and phosphate and on Indian and acquired lands for such metals and minerals as copper, iron, lead, manganese, nickel, tungsten, uranium, vanadium, zinc, asbestos, barite, bentonite, clay, coal, garnet, gypsum, feldspar, fluorspar, limestone, mica, peat, phosphate, pumice, quartzite, quartz crystal, sand and gravel, stone, and vermiculite.

Mining supervision includes responsibility for investigating and reporting on applications for leases and prospecting permits; recommending lease terms; enforcing compliance with lease terms and regulations governing the conduct of prospecting, mining, and milling operations; and determining the royalty liability of lessees, maintaining accounts, preparing statements, and receiving payment of royalties and rentals.

As of June 30, 1961, there were 3,062 properties under supervision involving leases, permits, and licenses in 30 States. Two thousand and twenty-nine were on public land, 290 on acquired land, and 743 on Indian land. Production during the fiscal year is estimated at 26,364,000 tons, valued at $165,300,000 with royalties amounting to $7,870,000.

A further breakdown of production figures for these lands shows potash ranking first with 12,631,800 tons valued at $73,170,000 followed by coal, 5,440,000 tons valued at $33,630,000; phosphate, 2,057,000 tons valued at $5,655,000; and uranium ore, 1,484,000 tons valued at $21,351,000. Other production in substantial quantity includes sodium compounds, 1,037,000 tons valued at $26,736,000, and sand and gravel, 2,872,000 tons valued at $2,432,000.

## *Mining Highlights*

Among notable mining events during the year was the November start of a new soda-ash mine and refinery at Stauffer, Sweetwater County, Wyo., about 21 miles northwest of the town of Green River. Two mine shafts are being sunk to a depth of 1,000 feet to tap the "Big Island" trona deposit involving Federal, State, and Union Pacific Railroad lands. The first trona mine at nearby Westvaco has been in operation since 1947.

To develop one of the richest potash deposits in the United States shaft sinking operations began during March 1961 on the Cane Creek anticline southwest of Moab, Utah. Discovery had been made on prospecting permits issued by the Department of the Interior. A 6-mile railroad will be constructed from Crescent Junction to the mine and a refinery site in the Colorado River Canyon.

Prospecting operations in northwest New Mexico on Federal, Indian and privately owned land have disclosed three-quarters of a billion tons of coal in deposits suitable for strip mining. These deposits will provide fuel for thermal power plants planned or under construction in New Mexico and Arizona.

Several major mining companies are prospecting in southeast Missouri where they have made valuable discoveries of lead and zinc in sediments, and prospectively valuable discoveries of copper and iron in basement rocks. A modern mill near Viburnum has been completed and placed in operation, and additional shafts are being put down on new discoveries.

## *Oil and Gas Leasing*

Supervision of oil and gas activities includes operations for the discovery, development, and production of crude oil, natural gas and products extracted from natural gas, on Federal, Indian, and certain military and Naval petroleum reserve lands.

*Pulling a core barrel during exploration for potash on public lands at Cane Creek Utah. This work led to discoveries resulting in a new industry for Utah with an initial investment of $25 million for new access roads, plant, mineshaft, railroad, etc.*

Unitization activities of oil and gas operations involving public and acquired land were reflected in the approval of 91 new plans during the year and the termination of 83 that had been previously approved, leaving 428 approved plans covering 7,929,970 acres outstanding. About 59 percent of the petroleum, 44 percent of the natural gas, and 60 percent of the gasoline and liquified petroleum gases obtained from public and acquired lands during the year were produced under approved unit agreements.

On the Outer Continental Shelf, no unitization plans were approved and one was terminated during the year. The total now stands at 14, embracing 333,253 acres.

*Table showing supervised oil and gas activities*

PROPERTIES AND WELLS UNDER SUPERVISION

| Lands | Number of properties | Acres | Number of States | Wells spudded | Wells completed | Completions productive [1] | Number of wells, June 30, 1961 | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Productive [1] | Total |
| Public | 135,132 | 103,022,415 | 24 | 2,144 | 2,181 | 1,413 | 19,512 | 33,422 |
| OCS | 456 | 1,710,951 | off 3 | 431 | 499 | 387 | 2,176 | 3,047 |
| Acquired | 6,387 | 4,417,032 | 30 | 88 | 94 | 45 | 379 | 998 |
| Indian | 11,769 | 4,329,745 | 16 | 623 | 699 | 469 | 7,053 | 11,593 |
| Naval petroleum reserve No. 2 | 17 | 9,226 | 1 | 7 | 8 | 8 | 482 | 738 |
| Military and miscellaneous | 21 | 17,981 | 4 | 29 | 19 | 19 | 168 | 200 |
| Total | 153,782 | 113,507,350 | -------- | 3,322 | 3,500 | 2,341 | 29,770 | 49,998 |

PRODUCTION, VALUE, AND ROYALTY LANDS UNDER SUPERVISION

| Lands | Oil, barrels | Gas, 1,000 cubic feet | Gas liquids, gallons | Value | Royalty |
|---|---|---|---|---|---|
| Public | 160,526,000 | 507,069,000 | 365,734,000 | $501,093,000 | $62,217,000 |
| OCS | 55,476,000 | 310,680,000 | 0 | 253,568,000 | 47,556,000 |
| Acquired | 5,268,000 | 22,941,000 | 245,000 | 20,592,000 | 2,641,000 |
| Indian | 53,427,000 | 88,531,000 | 122,153,000 | 162,491,000 | 20,591,000 |
| Naval Petroleum Reserve No. 2 | 4,770,000 | 5,445,000 | 13,860,000 | 16,560,000 | 2,239,000 |
| Military and miscellaneous | 1,361,000 | 40,934,000 | 3,356,000 | 9,740,000 | 1,426,000 |
| Total | 280,828,000 | 975,600,000 | 505,348,000 | 964,044,000 | 136,670,000 |

[1] Multiple completions (2 or more separately productive zones) are counted as separate wells.

NOTE.—Production and royalty figures include some estimates. Royalty figures do not include revenues from rentals and bonuses. Not included in the table, but also under supervision, are 1 salt and 5 sulphur leases in the OCS which yielded about $711,000 in royalties on production during the year.

On Indian lands, 12 new units were approved and none were terminated; the total number of plans in effect at the end of the year being 72, involving 134,975 acres.

There were 169 drilling units, or communitization agreements, approved during the year and 3 terminated making a total of 1,187 outstanding as of June 30. Three development contracts were approved and none terminated. A total of 17 such contracts were outstanding on June 30 involving 5,955,310 acres.

## *Connally Act Administration*

The Connally Act of February 22, 1935, supports conservation activities of oil-producing States by prohibiting the interstate shipment of oil produced in violation of certain State oil and gas conservation laws. This act is administered by the Federal Petroleum Board at Kilgore, Tex., under supervision of the Geological Survey.

While the Connally Act is applicable wherever State laws limit the rate of production and prescribe conditions for producing and handling oil, its chief application is in 106 counties of Texas, Lea and Eddy

Counties in New Mexico, and all of Louisiana. The Board also enforces provisions of the act in Mississippi, Oklahoma, Arkansas, and Kansas.

Unless exempted by the Board in writing and by notice, producers within designated areas are required to maintain daily production records and file monthly production reports of operations on each lease in an oilfield. Transporters and refiners are also required to file monthly reports covering operations in 4,607 separate oilfields. They account for approximately 4,040,800 barrels produced daily from Texas, Louisiana, and New Mexico. Producing wells increased from 99,370 to 101,824 during the year.

At the beginning of the year there were 13 cases of alleged violation of the act on the docket of the Board and 11 new investigations were started. Nine cases resulting in fines of $53,800 were settled.

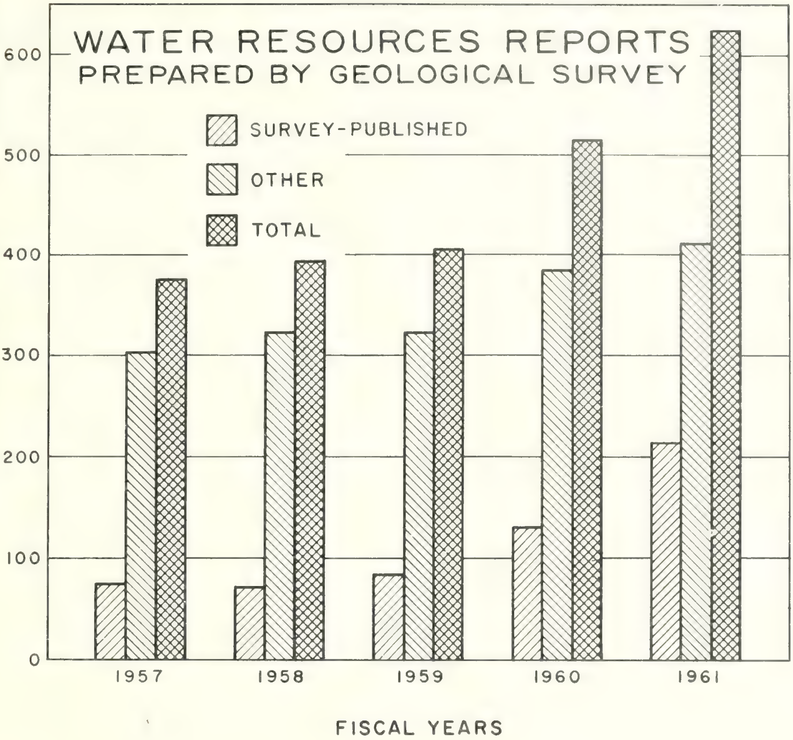
## *Water Resources Division*

One of the major resource problems facing the Nation today is the need for new facts and knowledge about water to provide a sound basis for water management. The United States is a water-rich country but local shortages have become common during the past decade and are a matter of growing public concern.

The aim of water management is to obtain optimum use of available supplies based on a thorough understanding of the characteristics of the resource and on quantitative facts regarding its inconstant availability. Hence water investigations of the Geological Survey have two purposes: To increase knowledge concerning its occurrence, movement, and interaction with the environment; and to provide a running tabulation of water supplies from year to year—where they are and how much.

The planning of investigations to meet these general objectives is oriented specifically toward information needed to solve major water problems, each of which has a distinctive geographic distribution.

The Geological Survey water resource investigations include the systematic collection, analysis, interpretation, and publication of hydrologic and related data; appraisal of water resources of specific areas; study of water requirements for industrial, domestic, and agricultural uses; and research and development in hydrologic principles and processes to improve the scientific basis and techniques of investigations. The results of these investigations and their allied research studies are published either as reports of the Geological Survey, reports of cooperating State agencies, or in scientific journals.



### ater Resources Reports

Inasmuch as public opinion indirectly governs the development and tilization of water resources, information on the principles of ydrology and on the availability and long-term supply of water ıust be communicated not only to those concerned directly with ater development and management, but also to the general public. The effectiveness of water-resource management in the future will epend on the availability of reports which provide necessary facts nd scientific interpretation. The primary emphasis on Survey-pubished reports has resulted in the production of almost double the umber produced the year before.

During fiscal year 1961, the Survey prepared 163 water supply apers, 20 circulars, 22 professional papers, and 9 bulletins concernng water. In addition, 76 reports were made available for public eference and 335 reports were prepared for publication as cooperaive State reports and as abstracts and articles in scientific journals. hree chapters of a new manual of hydrology were published during he fiscal year, making a total of six chapters completed since the anual was started in 1959. Chapter 7 is in manuscript.

Survey water-resources investigations constitute a coordinate effort between Federal, State, and local agencies. Cooperative investigations began in 1895 and have grown steadily, now constituting about 58 percent of the total program. Funds made available by States and local agencies in 1961 for cooperative investigation include:

*State and municipal offering for cooperative water resources investigations*

| State | 1961 | State | 1961 |
|---|---|---|---|
| Alabama | $165, 956 | Nebraska | $131, 75 |
| Alaska | 11, 539 | Nevada | 79, 49 |
| Arizona | 206, 556 | New Hampshire | 16, 57 |
| Arkansas | 97, 559 | New Jersey | 221, 04 |
| California | 832, 425 | New Mexico | 160, 23 |
| Colorado | 246, 683 | New York | 374, 68 |
| Connecticut | 52, 461 | North Carolina | 163, 63 |
| Delaware | 45, 699 | North Dakota | 91, 88 |
| District of Columbia | 3, 172 | Ohio | 206, 15 |
| Florida | 374, 876 | Oklahoma | 150, 47 |
| Georgia | 196, 111 | Oregon | 132, 93 |
| Guam | 16, 800 | Pennsylvania | 270, 64 |
| Hawaii | 208, 299 | Puerto Rico | 92, 39 |
| Idaho | 89, 987 | Rhode Island | 33, 72 |
| Illinois | 109, 128 | Samoa | 3, 00 |
| Indiana | 214, 301 | South Carolina | 43, 58 |
| Iowa | 117, 106 | South Dakota | 67, 12 |
| Kansas | 219, 325 | Tennessee | 113, 72 |
| Kentutucky | 146, 822 | Texas | 457, 42 |
| Louisiana | 271, 477 | Utah | 213, 88 |
| Maine | 28, 251 | Vermont | 11, 76 |
| Maryland | 84, 373 | Virginia | 55, 27 |
| Massachusetts | 90, 930 | Washington | 234, 76 |
| Michigan | 135, 431 | West Virginia | 48, 38 |
| Minnesota | 133, 018 | Wisconsin | 90, 41 |
| Mississippi | 99, 253 | Wyoming | 48, 62 |
| Missouri | 56, 799 | | |
| Montana | 69, 655 | Total | 7, 833, 59 |

## *Surface Water Investigations*

Streamflow and other surface-water data were obtained at 7,400 sites distributed throughout the 50 States, Guam, Samoa, and Puerto Rico. A special summary of all streamflow records for the period 1888–1950 is essentially complete; summaries for all States but one have been published. Reports were published covering the north Atlantic slope basins, the south Atlantic and eastern Gulf of Mexico basins, and the Great Basin.

Flood-frequency analyses, parts of a nationwide study, were completed for the Lower Mississippi River basins and for south Atlantic slope basins, James River in Virginia to Savannah River in Georgia. Pending completion of this project, preliminary statewide analyses are being made in cooperation with several State agencies. Reports were made available in 1961 covering Indiana, Kansas, New York, New Mexico, Ohio, Pennsylvania, Tennessee, and Wisconsin.

Five flood reports were published as water-supply papers or circulars:

Floods of August–October 1955, New England to North Carolina.
Floods of May 1955 in Colorado and New Mexico.
Floods of January–February 1959 in Indiana.
Floods of September 1960 in eastern Puerto Rico.
Floods of February–March 1961 in the southeastern States.

As part of its continuing program for mapping flood-inundated areas, the Survey published two hydrologic investigations atlases that show areas flooded in recent years in the vicinity of Chicago Heights, Ill., and Mount Vernon, Ohio. Flood-inundation maps covering 16 metropolitan areas in six States are nearing publication and work is n progress on similar maps covering 5 additional metropolitan areas n five States.

Runoff studies of maximum annual floods for 2,443 drainage areas of less than 400 square miles have been made and reports are being prepared at the request of the Soil Conservation Service. Hydraulic data for 69 drainage-structure sites were furnished to highway departments in 13 States.

Compacts for the apportionment of interstate waters usually include provision for measurement of streamflow, commonly by the Geological Survey. Seventeen such agreements are in effect and eight others are under negotiation. In addition, water-resources investigations were continued along the Canadian boundary as required by the Boundary Water Treaty of January 11, 1909.

### *Ground-Water Investigations*

The ground-water program includes systematic collection, analysis and interpretation of hydrologic and geologic data; research in fundamental principles of ground-water hydrology and hydraulics; equipment development; and operational research and training to improve the scope and methods of investigations.

During the 1961 fiscal year work progressed on 480 ground-water projects including an urgently needed study of the basin of the Colorado River downstream from Davis Dam. As development of its resources proceeds, the Colorado River basin inevitably will present one of the Nation's very "tight" water-supply situations. Objective of the study is to determine hydrologic relationships upon which to base competent management of all the water at optimum effectiveness for all foreseeable purposes and under all foreseeable situations. Current plans contemplate intensive studies with special attention to ground water over a period of 6 to 8 years.

A second large areal study is continuing in the Mississippi Embayment. This apparently water-rich region, covering about 90,000 square miles in parts of nine States, receives 45 to 50 inches of precipitation in average years and is crossed by several large rivers. Nevertheless, drought is common during the growing season. The study is aimed at an understanding of the regional geologic environment and its influence on the response of the hydrologic system to climatic fluctuations and to water-supply development. Application of this knowledge will lead to the most effective use of the area's potential water resources. The study begun in 1957 is scheduled for completion in 1966.

In the West, significant progress has been made in the use of electric analog models for analyzing ground-water flow problems. A Survey-built unit has been placed in operation at Phoenix, Ariz., to provide district offices with technical advice and support in the analysis of specific hydrologic problems. Establishment of this unit culminates a long period of research and development by a Survey research team.

A summary of the ground-water situation in the United States as of 1960 is in preparation. This will provide a sequel to the summary published for 1950. The earlier publication, Survey Circular 114, is still in demand, but the third printing was exhausted several years ago. All of which alerted Survey officials to the value of a periodic summary of the Nation's ground-water situation, and will stimulate the effort to prepare a new one at least every 10 years.

## *Chemical Quality of Water Investigations*

Programs in water quality are oriented to fundamental and applied research supported by intensive areal investigations and by operation of national networks of observation stations. Studies are carried on in all the major river basins and in many smaller drainage areas. An important part of this work is evaluating the quality of ground-water supplies.

Some examples of current research in scientific hydrology relating to water quality include: studies in atmospheric chemistry; exchange phenomena of radioactive substances; occurrence and distribution of minor elements in fresh and saline waters; isolation and measurement of organic complexes in water; effects of plant and animal life on water quality; sorption of radionuclides on earth materials; and geochemistry of iron and manganese compounds in natural waters.

Reports published in 1961 included: Methods for the collection and analysis of water samples; complexes of ferrous iron with tannic acid; ammoniated thermal waters; iron content of selected water and land plants; and quality of surface waters for irrigation. In addition to hese formal reports, a large number of replies were prepared covering requests for water-quality information.

### Sediment Investigations

A Survey evaluation of sediment loads in drainage basins throughout the Nation continued in 1961 with intensive studies of sediment transport centered in the Missouri, Colorado, and Middle Rio Grande basins.

Research in this field included: distribution and concentration of radioactive wastes in streams by fluvial sediment; transport parameters in sand bed streams; roughness in alluvial channels and sediment transportation; mineralogy of fluvial sediments; statistical techniques for utilization of sediment reconnaissance data; and methods for measurement and analysis of sediment loads in streams. Investigations of sediment yields and trap efficiency of reservoirs in small watersheds were continued in collaboration with the Soil Conservation Service.

Reports made public during the year discussed dispersion and concentration of radionuclides on stream sediments; transportation of sediment in alluvial channels; effects of depth of flow on discharge of bed material; quality of surface waters of the United States; and related subjects.

### Soil and Moisture Conservation

Hydrologic and geologic investigations to provide data for use in conservation programs of land administration agencies were continued on about the same scale as those in effect during the preceding year. Studies connected with the development of range-water supplies were made in many areas of the western States with emphasis on studies covering grazing districts or geographical units.

Reports planned for publication as Geological Survey Water-Supply Papers were prepared for western Utah; the Ely Grazing District, Nev.; a part of northeastern Montana; a part of southwestern Idaho; and the Mescalero Indian Reservation, N. Mex. Data on runoff and sediment yields and on the progress of erosion were collected in Montana, Wyoming, Colorado, New Mexico, Arizona, and Utah. A report summarizing studies made during the period 1947–59 was prepared for publication. Research was carried forward on soil-plant-water relationships on both upland areas and range-water spreaders. Appraisals were made of the hydrologic effects of installed measures on range lands in several localities.

*Saltcedar study site near Buckeye, Ariz., before the reestablishment of vegetation. The tall mast carries instruments to measure wind, temperature and humidity profiles. The shorter mast supports radiation measuring devices.*

## *General Hydrologic Investigations*

In the field of stream morphology, research was continued on the interrelation of factors influencing stream-channel characteristics. A study was made of channel widening and flood-plain construction on the Cimarron and Red Rivers in Kansas and Oklahoma. Studies of the causes of cutting or filling of channels were made in several localities ranging in environment from the Southwestern deserts to alpine areas of the Northwest.

Research to develop methods of interpreting the flood history of rivers from the growth and form of trees on their flood plains is being continued. In addition, a study of the botanical history related to selected glaciers of Mount Ranier was made and a report prepared.

*nterior Department hydrologist watching the spread of a thin film of octadecanol a floating waxy fluid for the suppression of evaporation in small reservoirs). The cene is a small stock tank near Laredo, Tex.*

Studies such as these will aid in extending hydrologic records backvards both in space and time.

In recognition of the need for conserving water, considerable mphasis was given during the year to collecting data and conducting esearch on water losses by evaporation from free water surfaces and ranspiration by plants. Measurements of evaporation were made at ites in Arizona, California, Texas, and Oklahoma. Laboratory and ield research were continued to develop methods to suppress evaporaion by applying and maintaining a monomolecular film on a water urface. The method found most successful to date involves using ctadecanol spread by a wind-controlled dispenser such as that shown n the accompanying photograph.

## *Phreatophyte Studies*

Studies of the use of water by vegetation of little or no economic value, and of ecological changes that may be anticipated by removing such vegetation, are in progress in several areas and environments. An intensive study on the consumption of water by saltcedar (Tamarix pentandra) is being conducted by Geological Survey in cooperation with the Department's Bureau of Reclamation in the valley of the Gila River near Buckeye, Ariz. An effort is being made to determine the physical and physiological factors that determine rate and quantity of the water use. In the Humboldt River Valley near Winnemucca, Nev., Geological Survey is participating with other Federal and State agencies on the use of water by greasewood and willows.

### *Hydrologic Studies*

Studies of the hydrologic effects of juniper-pinyon removal in the Carrizo-Corduroy area of the Fort Apache Indian Reservation, Ariz., was continued for the fourth year. This research is concerned with changes in runoff, sediment yield, soil moisture, and changes in vegetation resulting from the removal of the trees. A progress report covering the first 3 years of study was prepared.

Studies on the hydrologic effects of urbanization were continued. The work included an intensive program of data collection and analysis conducted in three small watersheds in the San Francisquito basin near Menlo Park, Calif., and broader scale, more generalized studies comprising analyses of runoff records collected in sewered areas and urban watersheds in several cities. On the San Francisquito project, comparisons will be made of hydrologic conditions before and after residential development.

### *Hydrology of Glaciers*

Glacial hydrology is another field of water resources investigation which recently has been given increased attention. Glaciers in the United States (south of Alaska) contribute nearly 2 million acre-feet of water to streamflow each summer. Basic glaciological research, together with an intensive program of meteorologic and hydrologic data collection on South Cascade Glacier, Wash., has revealed the distinctive characteristics of glacier runoff and has led to better understanding of the ice melt and runoff processes.

The sensitive but enigmatic response of glaciers to climatic changes is also under active study. Mass budget determinations made each year

*Glaciologists taking snow cores from a Glacier in western United States to obtain profiles of snow density, hardness, grain size, wetness, and dirt content.*

on South Cascade Glacier serve as indices of glacier behavior and climatic trends in the Northwest.

## *Technical Assistance Program*

Under auspices of the International Cooperation Administration, Geological Survey hydrologists worked with 11 foreign governments in water-resources investigations broadly directed toward the advancement of national economies. Long-term projects were carried on in Afghanistan, Chile, Egypt, Iran, Libya, Pakistan, Philippines, Saudi Arabia, Sudan, Turkey, and Tunisia. Geological Survey scientists were assigned for short periods to Brazil, Egypt, Nepal, Philippines,

*Cartographic aid of the Geological Survey puts finishing touches on the shaded relief drawing of Oahu, Hawaii. Although this plate is produced with black ink by the artist, it will be printed in brown on the final map.*

and Thailand to assist with expanding current water programs or to help solve special problems.

Survey overseas programs emphasize the establishment or strengthening of host-country water-resources investigation agencies. On-the-job training in methods and techniques of conducting investigations and the providing of advisory assistance in organizational problems are principal activities of the overseas programs. In the 11 host countries, to which Survey personnel were assigned, more than 150 local citizens were given technical training and education. In addition, 46 individuals from 25 foreign countries were given training in the United States.

## *Topographic Division*

The Topographic Division of the Geological Survey prepares and maintains the National Topographic Map Series covering the United

States and its territories and possessions. Mapping operations include four major phases: Aerial photography, geodetic control, photogrammetric and field surveys, and cartographic work.

Related activities include research and development of mapping instruments, methods and techniques; the preparation of special maps and supplying Federal agencies and the general public with published maps, advance map materials, aerial photography, geodetic control lists, and map information.

Through the International Cooperation Administration, the Geological Survey extends technical assistance to many nations and their accredited representatives. During fiscal year 1961, extended periods of technical training were provided by the Topographic Division to visitors from Brazil, Chile, Columbia, El Salvador, Iran, Japan, Mexico, Pakistan, Sudan, and Tunisia. A topographic mapping team was sent to Yemen to execute a topographic survey of the city of Taizz. A technical expert was furnished to ICA for 4 months for the purpose of conducting an investigation of topographic mapping facilities in Brazil.

### *Training Program*

The Division assisted in a Geological Survey photogeologic training program by providing brief periods of instruction in photogrammetry. Tours of Division mapping facilities as well as technical discussions on equipment and procedures were arranged for visitors from abroad. Mapping of Libya and Saudi Arabia continued in support of geologic investigation.

Staff work continued for the domestic names activity of the Board on Geographic Names resulting in the publication of three lists containing decisions on 1,418 names. Another list containing 447 names was published on July 1.

### *Surveying and Map Preparation*

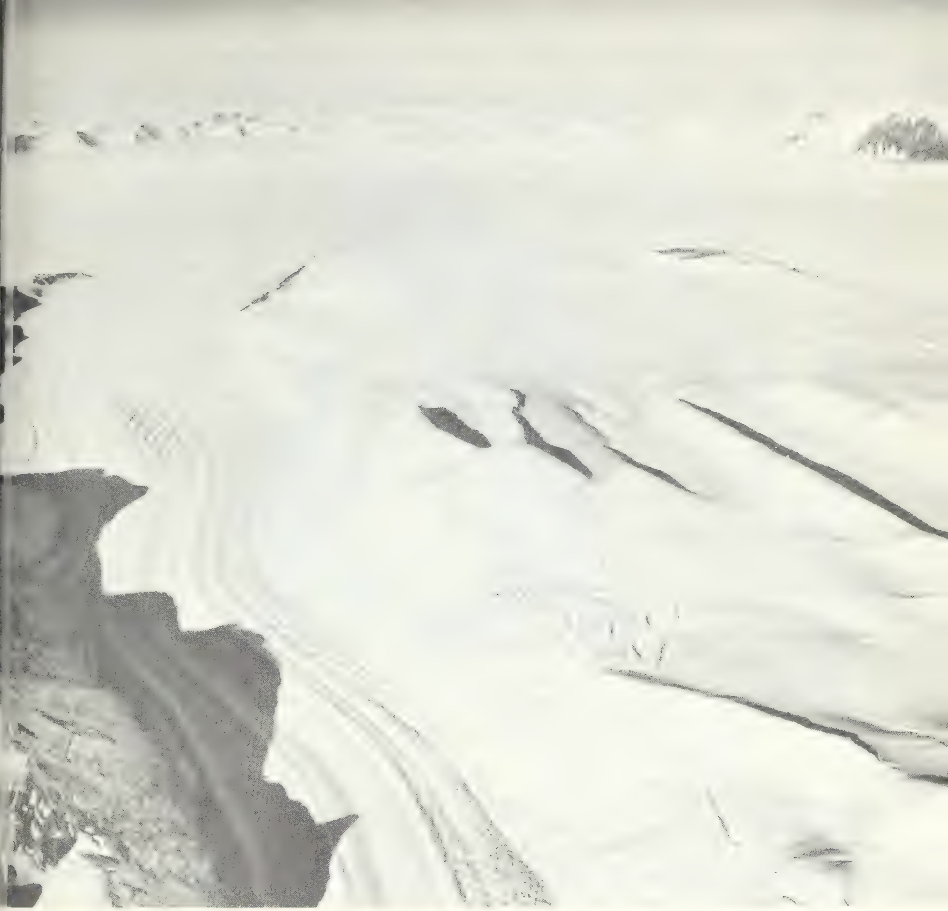
As a result of the surveying and cartographic operations of the Topographic Division, 111,000 square miles of new standard topographic mapping were completed during the year at scales of 1 : 24,000 and 1 : 62,500 (1 : 63,360 in Alaska). In the revision program, 12,600 square miles were completed. The Division also completed 3,600 square miles of new mapping and 3,400 square miles of revision using

*Survey map makers use scooters to carry themselves and their instruments ove moderately rugged terrain in the Western States.*

topographic survey data of other civil agencies and the Departmen of Defense.

In addition, numerous special maps were published for variou purposes such as research, administration, or information. In co operation with the Department's National Park Service, several parl maps are being made, among them Lassen Volcanic, Olympic, Yosemite, and Wind Cave. Cartographic compilation is in progres for State maps of Minnesota, Montana, Nebraska, Nevada, North Dakota, South Dakota, and Washington. Urban area maps were published for New York City and Madison, Wis.

Quadrangle mapping projects were underway in most of th States, the Virgin Islands, and Puerto Rico. Nearly 270 permanentl marked triangulation stations were established to provide control fo areas totalling more than 23,000 square miles. About 1,953 linea miles of transit traverse, 4,011 miles of electronic traverse, and abou 8,225 linear miles of levelling were run with permanent marks established at intervals of two or three miles. The results of these sur



*The vast and desolate area of Antarctica is being mapped by the Department of the Interior.*

veys are made available on request to other Government agencies and the public.

## *Antarctic Mapping*

Operations concerned with topographic mapping in Antarctica were conducted with the support of the National Science Foundation. During the 1960–61 austral summer, five engineers were assigned to the Antarctic area to establish control for mapping, using methods that combine solar observations and triangulation. Tellurometers, electronic distance measuring instruments, were used for the first time in the Antarctic, promising greater speed and efficiency for future control operations. More than 100,000 square miles of aerial photog

*Topographic engineers of the Geological Survey use the latest electronic distance measuring devices in mapping Antarctica.*

raphy were obtained at flight heights ranging from 18,000 to 25,000 feet by U.S. Navy Air Development Squadron Six (VX–6). A Survey photo-liaison technician was assigned in an advisory capacity to the Squadron's photographic laboratory in Christchurch, New Zealand, to insure that coverage of mapping-quality photography was obtained. Map compilations were completed in the vicinity of the Sentinel Mountains, the Executive Committee Range, the Thurston area and McMurdo Sound at scales of 1 : 50,000, 1 : 250,000 or 1 : 500,000. The Geological Survey continued to serve as the U.S. Antarctic Map and Aerial Photography Library, and provided consultant services to scientific and technical visitors.

Several mapping assignments were undertaken for other divisions of the Geological Survey and for other agencies. Included in this category were the detailed mapping of stream flood plains in Fairfax County, Va., and Emmons Glacier, Wash., from terrestrial photography. The 1 : 1,000,000-scale series of North America, published for Army Map Service, was completed.

During fiscal year 1961, cooperative programs were in effect with 32 States and Puerto Ricc. Total cooperative offerings during the year amounted to about $3,150,000.

The following table is a detailed summary by States of Survey map production during fiscal 1961:

*Areas (in square miles) mapped or revised during fiscal year 1961 for publication at standard scales (contour intervals, 5 to 100 feet)*

| State | Area mapped, scale | | Area revised | Total |
|---|---|---|---|---|
| | 1:24,000 | 1:62,500 | | |
| Alabama | 368 | | | 368 |
| Alaska | | 22,311 | | 22,311 |
| Arizona | 1,334 | | | 1,334 |
| Arkansas | 1,646 | | | 1,646 |
| California | 3,760 | | 672 | 4,432 |
| Colorado | 2,280 | 273 | 769 | 3,322 |
| Connecticut | | | 118 | 118 |
| Delaware | | | | |
| District of Columbia | | | | |
| Florida | 299 | | | 299 |
| Georgia | 643 | 256 | | 899 |
| Hawaii | | | 62 | 62 |
| Idaho | 2,613 | | | 2,613 |
| Illinois | 878 | | 55 | 933 |
| Indiana | 2,532 | | 901 | 3,433 |
| Iowa | 220 | | | 220 |
| Kansas | 2,858 | | 531 | 3,389 |
| Kentucky | | | 3,512 | 3,512 |
| Louisiana | | 1,460 | 192 | 1,652 |
| Maine | 548 | 198 | | 746 |
| Maryland | | | | |
| Massachusetts | | | 560 | 560 |
| Michigan | 923 | 177 | | 1,100 |
| Minnesota | 2,184 | 331 | | 2,515 |
| Mississippi | 1,587 | 51 | | 1,638 |
| Missouri | 1,945 | | 989 | 2,934 |
| Montana | 2,511 | 1,113 | | 3,624 |
| Nebraska | 1,372 | | | 1,372 |
| Nevada | 3,009 | 171 | | 3,180 |
| New Hampshire | | | | |
| New Jersey | | | | |
| New Mexico | 5,434 | 201 | 183 | 5,818 |
| New York | 80 | | 1,056 | 1,136 |
| North Carolina | 51 | 63 | | 114 |
| North Dakota | 1,604 | | 303 | 1,907 |
| Ohio | 13,387 | | | 13,387 |
| Oklahoma | 2,649 | | | 2,649 |
| Oregon | 87 | 876 | 1,153 | 2,116 |
| Pennsylvania | 1,473 | | 114 | 1,587 |
| Rhode Island | | | | |
| South Carolina | 377 | 244 | | 621 |
| South Dakota | 851 | | | 851 |
| Tennessee | 704 | | | 704 |
| Texas | 8,079 | 491 | 564 | 9,134 |
| Utah | 2,156 | | | 2,156 |
| Vermont | | | | |
| Virginia | 1,267 | | | 1,267 |
| Washington | 645 | | 95 | 740 |
| West Virginia | 2,410 | | | 2,410 |
| Wisconsin | 2,479 | | | 2,479 |
| Wyoming | 5,267 | 434 | 731 | 6,432 |
| Total | 82,510 | 28,650 | 12,560 | 123,720 |
| Puerto Rico | | | 388 | 388 |
| Virgin Islands | | | | |
| Total | 82,510 | 28,650 | 12,948 | 124,108 |

## *Research and Development*

Considerable accomplishment is noted in research and development for improving instruments, techniques, and procedures in mapping operations. Major efforts were devoted to the application

*The Geological Survey's new self-propelled electronic elevation meter automatically measures ground elevations. It is virtually a computer on wheels.*

of electronic devices and methods in control surveys; to improving the stability and imagery of aerial photography; to attaining better map accuracy; and to developing better treatment and symbolization for map features. The preparation and publication of the new Manual of Topographic Instructions continued as a major activity; four volumes have been published, and two more were in press at the end of the year.

Noteworthy accomplishments in research and development in field survey operations included the procurement of two new transistorized elevation meters for fourth-order vertical control for topographic mapping. These are vehicle-borne instruments to measure elevations of points on highways as the topographer drives along the road. Transistorization of the electronics has reduced power requirements and attendant problems significantly, and has reduced field troubleshooting to a simple routine of replacing printed circuit boards successively until the faulty one is located. Another major improvement over previous models is the inclusion of an automatic printing recorder, activated by pushing a button. This eliminates dangers of misreading, misrecording, or transposing digits, always present in manual recording. The addition of an electronic leveling adjustment greatly improves the instrument's accuracy and usefulness.

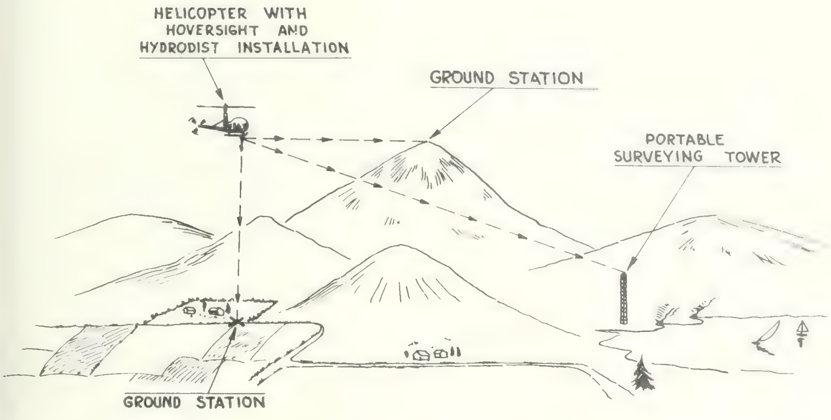


*Diagram above illustrates the operation of Geological Survey's "Hydrodist-Helicopter-Hoversight" system (H–H–H) using a precise electronic distance measuring instrument carried aloft by a helicopter equipped with a newly designed optical plummet which provides a means for plumbing the helicopter over a ground station.*

Both vehicle-mounted instruments are now in field use on control operations.

### *Hydrodist-Helicopter-Hoversight System*

Investigation was started on a unique system for the establishment of horizontal ground control, combining use of the Hydrodist, a precise electronic distance-measuring instrument; a helicopter for transportation, and as a platform for occupying a horizontal position; and the Hoversight, a newly designed optical plummet, which provides a means for plumbing the helicopter over a ground station.

In operation, Hydrodist master-units are located on the ground, or on towers, at known positions, and the helicopter, containing a Hydrodist remote unit and a hoversight, is in flight about 100 feet above the point for which a position is desired. Simultaneous viewing through the hoversight by the pilot and the observer indicates when distance and angle measurements can be made from known points to the remote unit. The system is designed for use in establishing both basic and supplemental horizontal control. Investigations are also underway to determine the feasibility of combining a vertical control system with the Hydrodist-Helicopter-Hoversight (H–H–H) system.

Fifteen production models of a new lightweight portable surveying tower have been delivered to the Survey. These can be erected and transported without disassembly and are intended particularly for theodolite observations and electronic distance measurements over trees and other obstructions. Production models at a 50-foot heigh have successfully undergone stability tests. Towers can be erecte and transported by helicopter or towed by a light field vehicle.

Research in photogrammetry included a study and field test o ground targets to determine proper target materials and configuration, dimensions, and colors that will provide precise identification o field-surveyed control points on aerial photography. This is expecte to lead to improved mapping procedures and improved map accuracy

## *Electronic Computer*

Research in analytical aerotriangulation was continued. A program has been developed for using high-speed electronic computer to determine mathematically the map-coordinate positions for image appearing on a strip of aerial photographs. The computer program will now establish positions for controlling a strip of nine consecutiv aerial photographs.

An investigation of the use of polyester-base films for aerial photography has continued. Geological Survey use of this dimensionall stable film has created enough interest so that three major film producers now supply this product. Investigations in film-developing procedures to obtain optimum image quality is continuing.

## *Projector Researches*

A new universal projector support frame has been developed capable of supporting Kelsh, ER–55, or Multiplex projectors, as well as super-wide-angle projectors when they become available. Features of the new table frame are a granite reference plane, an electrical system that will serve the several types of projectors, and an automatic light balance unit. Two Universal table frames were fabricated during the year, for operational testing. It is believed that the use of this equipment in quantity will provide operational flexibility and economy in photogrammetric surveys.

The prototype model of the Universal Orthophotoscope (Model U–60) has been used for several months for both research and production.

An intensive investigation was carried out to determine the comparative value of two existing automatic photographic dodging systems for diapositive preparation.

## *Map Information*

Facilities for supplying information on maps, aerial photography and geodetic control surveys to Federal, State, and local government

*Civil Engineering Technician of the Geological Survey is drawing topographic ap detail with the Kelsh plotter. This steroplotting machine employs swinging hts whose motions are controlled by arms attached to the tracing table thus ncentrating all of the light on the tracing table platen.*

gencies and to the public are maintained at the Map Information ffice in Washington and at Division field offices. Services include ver-the-counter map sales for the convenience of the public, com- ercial firms, and Government agencies; sale of prints of advance aterials from current topographic mapping and photostats of out- f-print maps; graphic or tabular assemblies of map, photographic, nd geodetic-control information.

The Map Information Office continued to serve as the central de- ository for maps which make up the National Atlas of the United tates. Among the sheets received this year from other Government gencies were 14 maps portraying mean sky cover, sunrise to sunset, onthly and annual.

## Publications

The results of research and investigations by Geological Survey cientists and engineers, both in the field and in the laboratory, are

made available to the public through a variety of reports and ma
Of the formal reports published by the Survey, books are print
by the Government Printing Office and maps are printed in t
Survey's own plant.

During the past fiscal year, 217 technical book reports we
published. Printed maps totalled 2,475, of which 1,690 were new a
785 were reprints. The 2,475 maps comprised 7,643,413 copies th
ranged in size from 13 by 18 inches to 50 by 72 inches. The Geolog
Map of the United States was reprinted during the year.

| | New | Reprinte |
|---|---|---|
| Topographic maps: | | |
| Standard topographic | 1, 070 | [1] 4 |
| Standard topographic (engraved) | ---------- | 1 |
| Standard topographic (revisions) | 122 | ---------- |
| 1:250,000 scale | 46 | |
| Scale conversions | ---------- | |
| Planimetric | 6 | |
| State base | 4 | |
| State topographic indexes | ---------- | |
| Miscellaneous | 4 | |
| Geologic maps: | | |
| Geologic quadrangles and miscellaneous investigations | 34 | |
| Mineral resources | 26 | ---------- |
| Geophysical investigations | 20 | ---------- |
| Conservation maps: River surveys | 27 | ---------- |
| Water Resources maps: Hydrologic atlases | 36 | ---------- |
| Maps for inclusion in book reports | 159 | ---------- |
| Maps for other agencies | 136 | ---------- |
| Total | 1, 690 | 7 |

[1] Includes 25 maps totalling 24,000 copies printed by other Government agencies.

Geological Survey maps are distributed and sold by mail and ove
the-counter from Washington, D.C.; Denver, Colorado; and Fai
banks, Alaska. In addition, over-the-counter map sales are made at 1
other Survey offices. Approximately 550 authorized commerci
agents throughout the United States also sell these maps to the publi

In addition to approximately 42,000,000 maps, books, and pamphle
at hand at the beginning of the year, 6,444,300 copies were received
new and reprinted maps, as well as 401,300 copies of reports. Di
tribution of 4,784,000 maps including 592,500 map indexes was slightl
more than last year's corresponding total of 4,579,100. Approx
mately 302,500 book reports and pamphlets and 134,700 copies of th
Survey's monthly announcement of new publications also were di
tributed during the fiscal year.

The total distribution was implemented by 246,700 individual order
Sale of maps to the public brought in $662,060.93, and that amou

as deposited to miscellaneous receipts in the United States Treasury. ll the book reports distributed by the Survey and 24 percent of all aps were provided free for official and educational use. General istribution of Survey book reports to the public is through sale by the uperintendent of Documents, Government Printing Office, Washgton, D.C.

The total number of publications distributed by the Geological Surey during this year as compared with last is shown in the following ble:

| | Fiscal year 1960 maps, map indexes and book reports | Fiscal year 1961 maps, map indexes and book reports | Percent of increase or decrease |
|---|---|---|---|
| ashington | 2, 786, 200 | 2, 698, 150 | −3 |
| nver | 1, 701, 400 | 1, 953, 300 | +15 |
| irbanks | 46, 000 | 47, 600 | +3 |
| her field offices | 320, 250 | 387, 450 | +21 |
| Total | 4, 853, 850 | 5, 086, 500 | +5 |

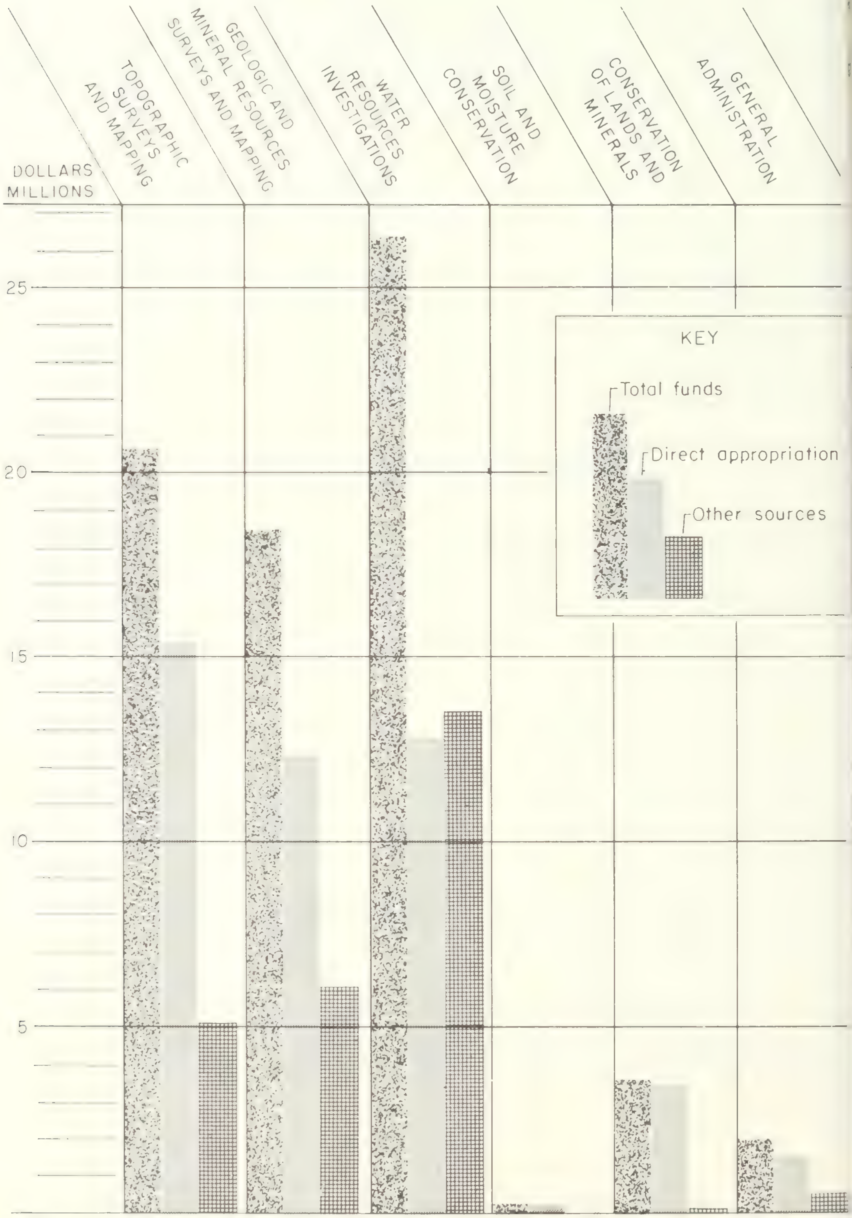
## *Public Inquiries Offices*

This years marks the 10th anniversary of the establishment of the rst Public Inquiries Office in Denver, Colo. Since then, 6 offices ave been added: Salt Lake City, Utah, in 1952; Los Angeles, Calif., nd Anchorage, Alaska, 1953; San Francisco, Calif., 1954; Dallas, ex., 1957; and Spokane, Wash., 1960. These seven offices provide oints of contact where the public can obtain nontechnical information about the work of the Survey. Technical and scientific questions re referred to appropriate sources. Each office has a library of urvey publications and is a depository for open-file reports on its eographic area. Survey maps and reports are stocked for sale overhe-counter.

During the 10 years that the Public Inquiries Offices have been perating there has been a tremendous increase in the number of sers of their facilities. During the first year of operation 4,662 isitors were served and a total of $7,600 was received in payment or maps and reports. Figures for fiscal year 1961 show 60,075 visiors and $90,100 received in payment for maps and reports.

### *Funds*

During Fiscal Year 1961 the Geological Survey incurred obligations otaling $71.3 million. Of this amount, $45.9 million was from funds appropriated to the Bureau and $25.4 million was made available l cooperating Federal, State and municipal agencies, licensees of tl Federal Power Commission and miscellaneous sources. The cha illustrates obligations by source of funds for each activity.



# *Bureau of Mines*

## Marling J. Ankeny, *Director*

GREATLY INCREASED OUTPUT of technical publications reflected the scope and speed of research and other studies by the Bureau of Mines of the Department of the Interior during fiscal 1962.

More publications were written by Bureau scientists than in any year since the agency was created in 1910. The gap between collection and dissemination of information regarding production, employment, and safety for all the mineral industries was reduced further.

Under the Helium Conservation Act of 1960, the Bureau began negotiations with industry to construct plants for producing this vital element for sale to the Government.

New successes were attained in the safety education programs conducted by the Bureau throughout the Nation's mineral industries. In the 1960 National Safety Competitions, a record number of participating firms completed the contest year without a single disabling injury.

Other attainments of the Bureau were varied and significant:

A widespread occurrence of beryllium mineralization was discovered in Idaho by the Bureau of Mines and the Idaho State Bureau of Mines and Geology.

Savings approaching $5 million a year were reported by Federal agencies employing a corrosion warning system developed by the Bureau.

A new pressure gasifier being developed by the Bureau made several highly satisfactory test runs on lignite coal.

Studies in new and improved uses for coal were aided by use of a adioactive isotope, Gallium 68.

An advanced helium gas recycle system, seeking utilization c nuclear heat for gasifying coal and for other industrial uses, complete 1,000 hours of continuous generation.

Several new mine-drainage projects for Pennsylvania's anthracit region were started.

A simple field test for detecting cesium and rubidium was develope by the Bureau.

Publications reflecting the Bureau's important studies in secondar recovery of petroleum received national acclaim.

A new Helium-Research Center was established at Amarillo, Te

Plans were announced for building an atomic-research facility fc studying the effects of gamma radiation on coal, metals, and nor metallics.

Details on accomplishments by the Bureau are given in the followin pages.

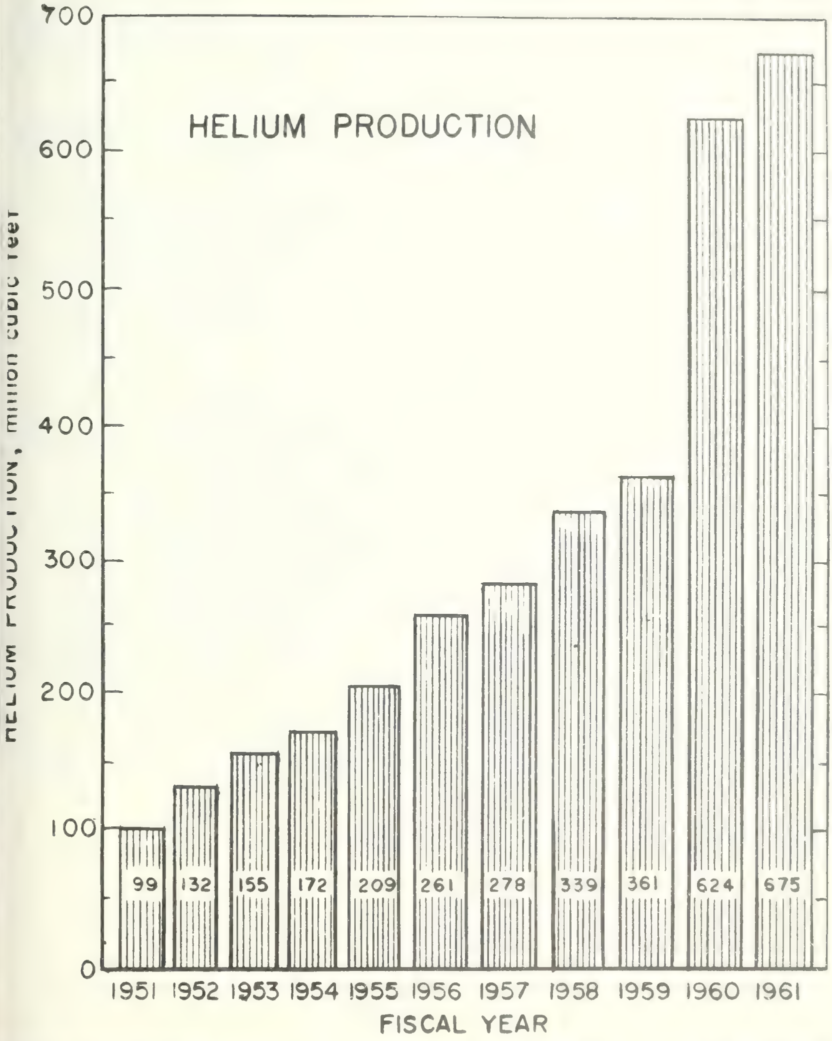
## *Helium*

Large-scale conservation of the Nation's irreplaceable helium resources was made possible when new legislation (Public Law 86–777 became effective March 1, 1961. The legislation is the foundation fc a long-range program to save for future use helium that otherwis would be wasted when helium-bearing natural gas is used solely fc its fuel content.

Under authority of the new legislation, the Department plans t purchase helium for conservation storage and future use from up t 12 new helium plants financed, built, and operated by industry. Th plants would be located on interstate pipelines carrying natural ga with a helium content above 0.4 percent to fuel markets from gasfield in the southwestern part of the United States. Helium acquired unde the program but not needed to meet present demand will be store underground in the Government-owned Cliffside gasfield nea Amarillo, Tex.

Proposals for the new plants were solicited from industry, and 1 firms responded with plans that included 23 possible plant sites. Fou of the firms, whose proposals had the best prospects for achieving cor servation, were selected for further immediate consideration. Negotiations on contract provisions began. If they prove successfu construction of four helium-extraction plants by industry will b assured. As funds become available, additional selections will b made for plants at remaining locations where helium conservation ca be achieved.

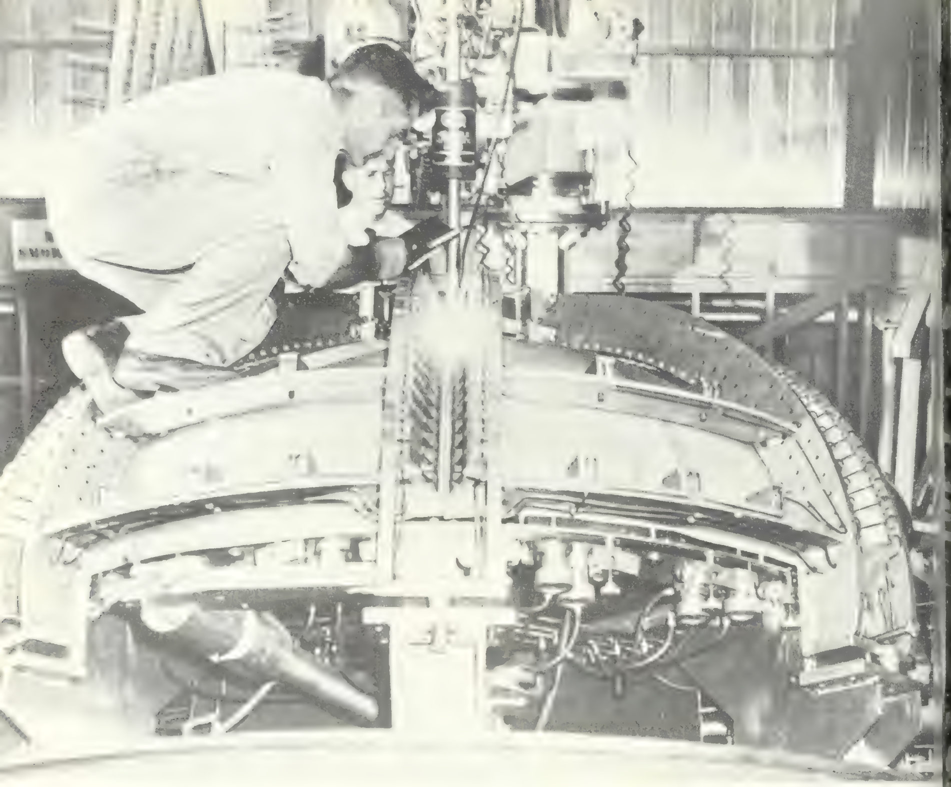
During the next 25 years, industrial plants and the existing fiv Bureau of Mines plants could recover about 88 billion cubic feet o



*lelium production rose sharply in the last two fiscal years as the new Bureau lant at Keyes, Okla., extracted helium from commercial natural gas before it was iped to fuel markets.*

elium. Total demand for the 25-year period is expected to be 36 illion cubic feet. Thus, 52 billion cubic feet would be stored for se after 1985.

The program is required to be self-liquidating, and the price of elium sold by the Bureau of Mines has been increased to about $39 thousand cubic feet to meet the pay-out obligations. However, early n the program, income from helium sales will not equal expenditures nd additional funds will be needed to sustain it. Funds to launch



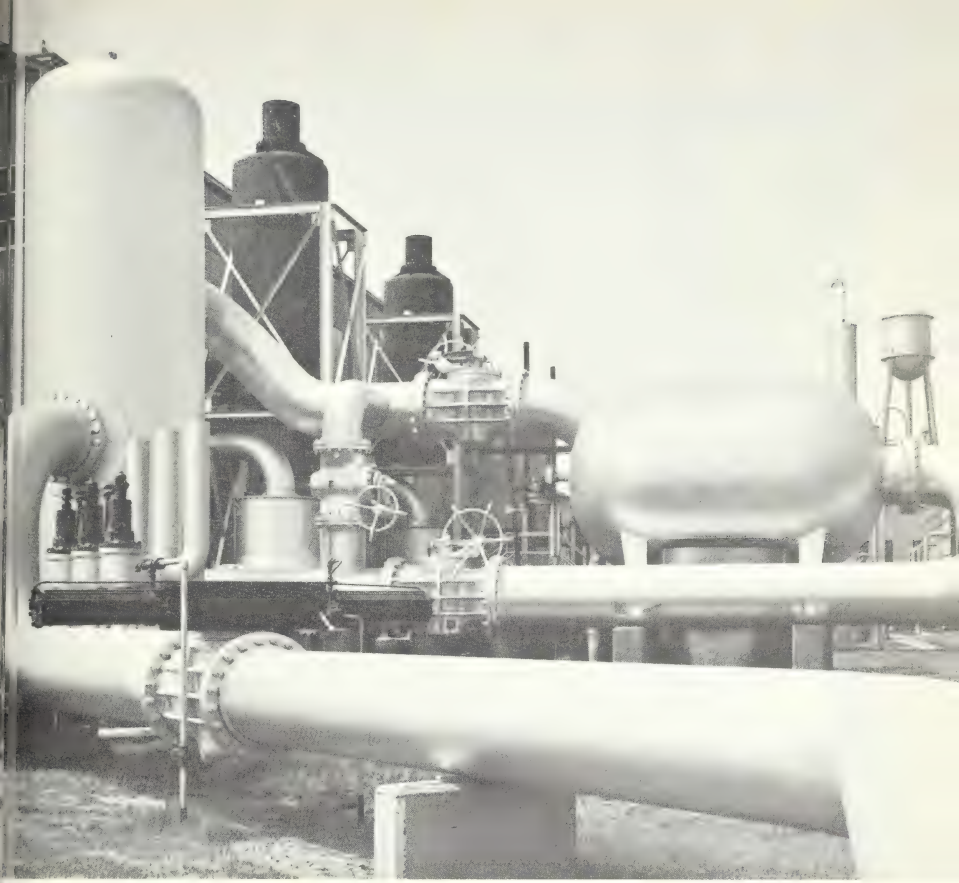
*Fuel tanks for the Titan intercontinental ballistics missile are welded with the ai of a helium-shielded arc.*

the program were included in the Department's budget request fo fiscal year 1962.

During fiscal 1961, accelerated demand for helium required ship ment of 523 million cubic feet, of which the Federal agencies receive about 75 percent. Production was greater than demand and totale over 675 million cubic feet. The excess was stored underground i the Cliffside field to increase the reserve stored there to 363 millio cubic feet. The stored helium must be purified before shipment, bu it is a reserve that had not been available previously.

## *Rockets and Missiles Big Users*

Helium was used by Federal agencies in rocket and missile pro grams, in wind tunnel and shock tube tests, in nuclear reactor develop ment, in medical research, in meteorological balloons, and for othe purposes. Commercial users employed helium in shielded-arc weld ing, leak detection, gas chromatography, low-temperature research inert atmospheres for growing silicon and germanium crystals, and i medical and scientific studies.



*This gas-cleaning equipment was added to the Bureau's Exell, Tex., plant during the year to increase its processing capacity to 130 million cubic feet per day.*

During 1961, all the Bureau's five helium plants at Amarillo and Exell, Tex., Keyes, Okla., Shiprock, N. Mex., and Otis, Kans., were in operation. At the Exell plant, the older section built in 1942–43 was shut down for modification and modernization to increase plant capacity about 30 percent. The gain was achieved by replacing older, less efficient low-temperature gas-processing equipment and modifying compressors to permit processing larger volumes of gas.

Although helium has been stored and withdrawn on a small scale from the Cliffside gasfield for several years, additional work was done to assure the integrity of the field for storing helium in the conservation program. A seismographic survey of the field confirmed that its geologic limits, as previously determined by other means, were known with adequate precision. Reconditioning of the gas wells in the Cliffside field began in May 1961 in preparation for receiving conservation helium for underground storage.

### *Helium Research Center Established*

In May 1961 a Helium-Research Center was established a Amarillo. The Research Center will use existing facilities and personnel and will continue some of the studies of properties and characteristics of helium-bearing natural gas and helium-gas mixture previously carried on at Amarillo. However, greater emphasis will b placed on basic helium research in connection with the helium-conservation program.

New reports were added to an open file of information develope from research on extracting helium from natural gas by low-temperature processing. This information will aid in designing an operating helium plants.

## *Minerals Developments*

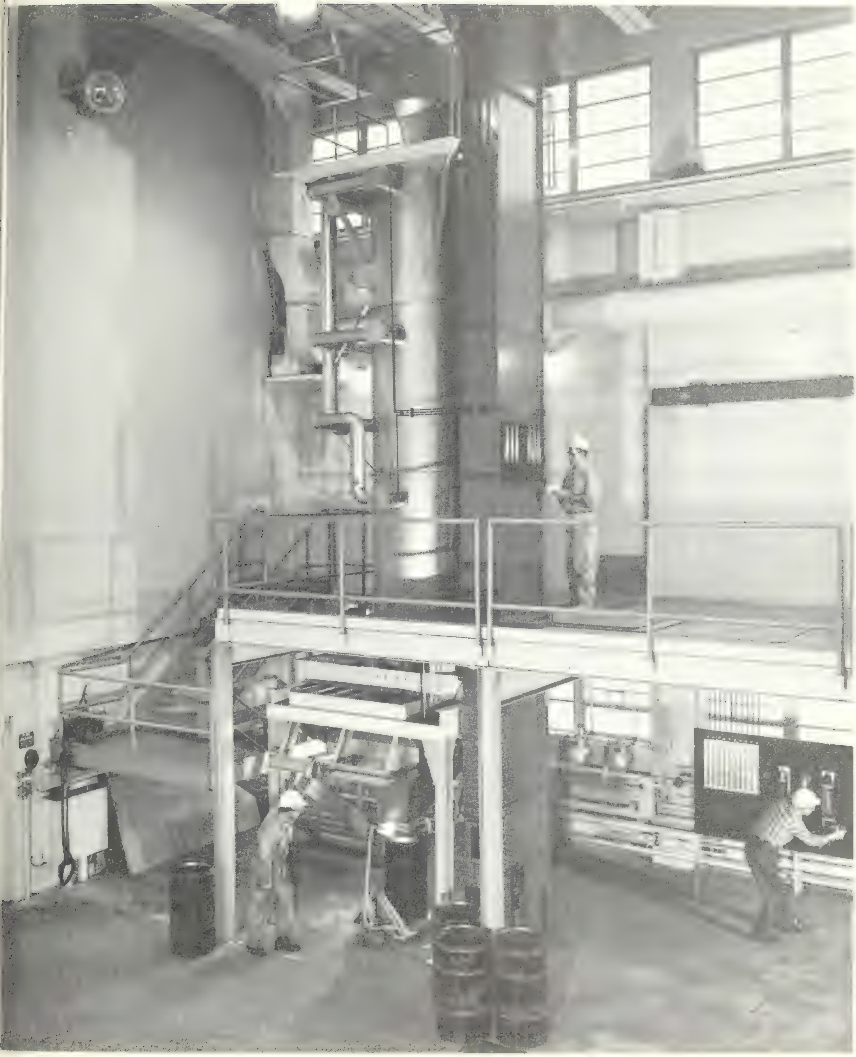
Research was emphasized during the year to meet increasingly urgent demands for metals, alloys, and compounds with the superio properties required for the Nation's space programs and other specia uses. Such materials must resist high and unusual stresses and corrosion at both elevated and very low temperatures. Mining researc activities were also intensified.

The Minneapolis Research Center at Fort Snelling, Minn., devote to studies in mining research, minerals beneficiation, and extractiv metallurgy, was dedicated June 10.

Assistance was given the Office of Minerals Exploration and th Office of Minerals Mobilization of the Department of the Interior, General Services Administration, the Office of Civil and Defense Mobilization, the Civil Service Commission, and other agencies. I addition, Bureau scientists served on many committees and boards including those of the American Society for Testing Materials; th American Institute of Mining, Metallurgical, and Petroleum Engineers; the National Academy of Sciences; the American Chemica Society; and the American Standards Association.

### *Ferrous Metals Technology Advances*

The Bureau's iron-ore program was directed toward making th large resources of low-grade domestic ores competitive in price an quality with higher-grade foreign ores. Mining studies on roc penetration and fragmentation; research on concentrating, extracting and agglomerating iron minerals; and research on reducing the concentrates and ores to iron were included in the program.



*Large shaft furnace built by the Bureau of Mines for experiments in utilizing domestic manganese ores.*

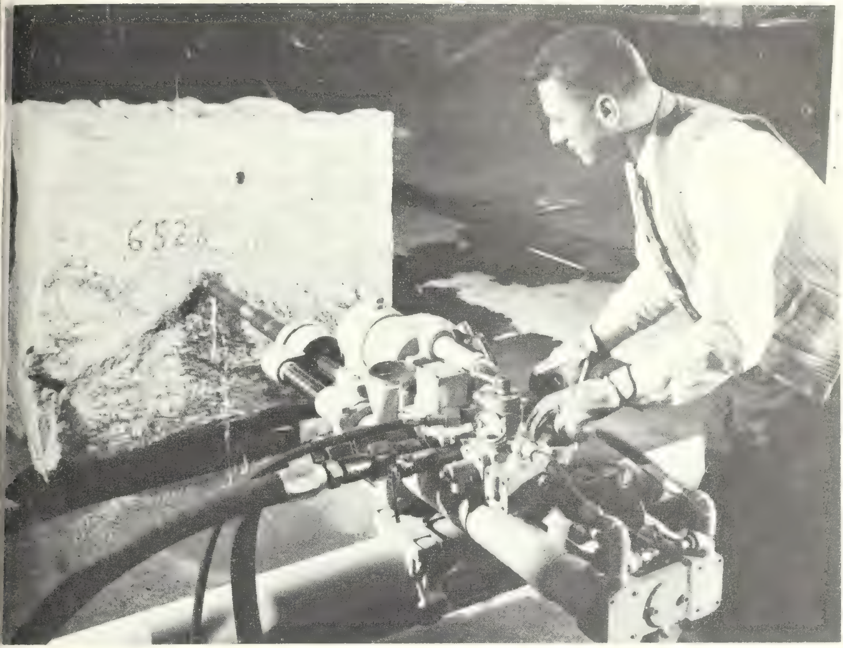
Flotation and magnetic concentration studies, significant in the Bureau's work on domestic low-grade iron ores, showed that high-grade concentrate could be produced. A Bureau publication described methods of beneficiating fines produced from Alabama red iron ores.

Research on agglomeration and partial reduction of iron-ore concentrate yielded important results. Blast-furnace feeds containing

*Drill-core library, maintained by Bureau of Mines, is consulted by geologists, mining engineers, and others interested in mineral development.*

80 percent iron were foreseen compared with ores of 60 to 70 percent iron, the best obtainable today. A report on the effect of particle size on the green strength of iron oxide pellets was published.

Use of the Bureau's small-scale experimental blast furnace to predict results of changes in operating industrial-size furnaces was described in a report. The experimental furnace operated throughout the year, largely in cooperation with private industry, to provide additional information on the injection of supplementary liquid fuels and to find the effects of higher blast temperatures, differences in burden, and other variables. Publications on the injection of natural



***Rock-penetration studies are undertaken with a special experimental drill.***

gas and solid fuels into the smelting zone of a blast furnace were issued.

## *Experimental Blast Furnace Aids Industry*

Successful application of the Bureau experimental blast-furnace research was a factor in the decision by one large steel company to build a similar furnace. Injection of supplementary fuels in the smelting zone of an iron blast furnace, pioneered by the Bureau of Mines, was adopted by industry. Eleven companies were using natural gas and coke oven gas to increase blast-furnace output and reduce coke requirements.

Theoretical studies of iron oxide reduction, conducted concurrently with the applied research, augmented knowledge of the chemical reactions in blast furnaces and in other iron reduction facilities.

Molten pig iron was desiliconized with oxygen as it was tapped from the Bureau's experimental blast furnace. The new technique used a Bureau-designed vortex cone reactor. Open-hearth steelmaking time was found to be reduced greatly by using low-silicon hot metal.

The Bureau program to determine the alloying effect of uranium i steel continued in an effort to develop new uses for the growing stockpiles of depleted uranium. High-strength uranium-bearing steel were made successfully in 300-pound melts and there was progress i determining the hardening effect of uranium in these steels.

### *X-Ray Probes Uranium*

Electron-probe X-ray spectrography was used to determine th distribution of uranium in steel. In a 5-percent uranium alloy stee 90 percent of the uranium was found at grain boundaries and onl 10 percent was distributed within grains.

A rapid-twist test experimentally determined the hot-working characteristics of molten steel before it was cast into ingots. Such a tes when perfected could divert melts with poor working properties t low-grade products and result in substantial savings to the stee industry. Methods for removing contaminants from steelmakin scrap and methods to increase use of scrap in the iron and stee industry were improved.

Tungsten research centered on techniques to improve purity and ductility, fabrication, and high-temperature oxidation resistance. Continuing studies of the fundamental properties of tungsten and it compounds produced scientific facts to aid industry's use of the meta in high-temperature technology. Already adopted is the Bureau' successful tungsten-coating process developed at the Rolla Metallurg Research Center. A commercial vapor plating plant using the process was installed recently with technical direction by Bureau metallurgists. Demand for the tungsten chemical employed in this proces justified commercial production of what only a short time ago was a laboratory curiosity.

Pure tungsten metal prepared by the Bureau's method was found to be one of the most satisfactory materials available for high-temperature uses in atmospheric and space environments. Promising new techniques for extracting tungsten from its ores and concentrates resulted from experiments by Bureau scientists, and may permit mining tungsten deposits hitherto considered unprofitable.

### *Fused-Salt Electrolysis Finds New Uses*

A new Bureau report described the Bureau's open-cell fused-salt electrolytic process for producing high-purity molybdenum directly from its oxides. This process promised to be an outstanding contribution in the extractive metallurgy of molybdenum. Bureau scient sts also investigated fused-salt electrolytic techniques for removing trace impurities from molybdenum, and studied molybdenum alloys systems for high-strength, high-temperature applications.

Researchers demonstrated the technical feasibility of producing chromium ferroalloys from offgrade domestic chromite, and the Bureau published a report describing electric smelting tests on Montana chromite concentrates. Fused-salt-bath electrolytic techniques or extracting chromium or its compounds directly from chromite were nvestigated. Effects of temperature and other variables on chemical eactions during electric smelting of chromite were studied.

A fluorescent X-ray spectrograph, developed by the Bureau, was described together with its instrumentation for dynamic selective-oxidation-rate studies. This apparatus measured in seconds the rate of formation of trace element oxides at temperatures above 1,400° F.

## *Evaluating Thermodynamic Properties*

The Bureau evaluated and compiled thermodynamic properties of 65 elements. It concluded its kinetic studies of the carbothermic reduction of manganous oxide and obtained significant information. Direct-reduction studies of low-grade Cuyuna Range materials yielded igh-iron products with good recoveries and a leachable synthetic manganese ore.

Thermal decomposition of manganese sulfate was accelerated appreciably by the addition of 5 percent petroleum coke. In the melt-quench-leach process for extracting manganese from rhodonite and other manganese silicates, simple means were found to control operating difficulties caused by gel formation.

Nickel with a cobalt content of less than 1 part per million and total impurities of about 100 parts per million was prepared from an impure cobalt-bearing nickel starting-material by the Bureau's new combination electrorefining and solvent extraction process. Cobalt containing only about 40 parts per million of nickel also was recovered from the same starting-material.

## *Nonferrous Metals Research Gains*

Research continued to develop methods for beneficiating domestic beryllium-bearing materials and to prepare high-purity beryllium metal and oxide. Disseminated beryl was recovered from low-grade ores in North Carolina in a concentrate suitable to produce high-grade beryllium compounds. Phenacite and bertrandite ores from Western States were concentrated successfully by flotation and a patent on the procedure was sought. Beryllium and uranium produced by molten-salt electrorefining techniques were of such high purity tha other Government agencies requested quantities large enough to permit evaluation for special applications.

Fundamental studies of experimental magnesium-base structura alloys determined the relation of composition and structure to tensile strength and vibration-damping capacity under various stress conditions.

Radioactive isotopes were used more effectively in measuring and controlling metallurgical processes. Isotope tracers helped to measure pulp flow rates, to determine the beryllium or trace metal content of ores and products, and to control the thickness of copper anodes during casting.

Titanium investigations developed basic data on reactions in the electrolysis of titanium in fused salt. A new approach to electrowinning titanium directly from its oxide was tested. Improved titanium-casting mold materials were prepared capable of containing molten metal at 2,100° C. Vapor-phase reduction of titanium tetrachloride with sodium was attained in the laboratory.

Research was completed in recovering alumina and fluoride from waste materials of aluminum production plants; a simple Bureau batch flotation technique was modified so it could be used in a continuous-circuit process.

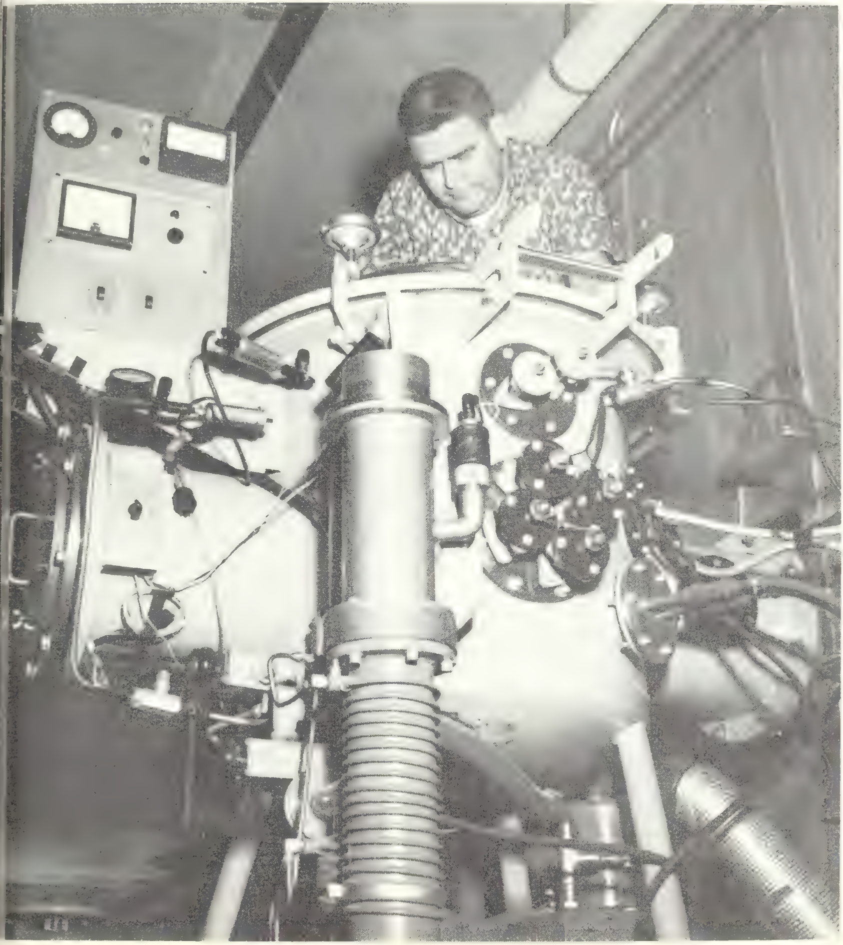
The Bureau published its research on a subhalide and a molten-zinc leaching process for recovering aluminum from crude alloys produced from domestic low-grade material. Studies progressed on electrolytic techniques for recovering aluminum from both high- and low-temperature fused-salt baths and organic baths. Basic data on reactions in the lime-soda-sinter process for recovering alumina from aluminum silicate materials also were published.

Research in the extractive metallurgy of cesium culminated in an improved method of producing metal of commercial purity at lower cost.

Field tests for identifying germanium and columbium were perfected, and a highly sensitive method for detecting tellurium was developed.

High-purity columbium was recovered experimentally from scrap columbium by electrolysis in a molten salt bath. Ductile hafnium containing less than 200 parts per million of oxygen was produced by the Kroll process.

A novel electrowinning solvent-extraction process for recovering rhenium was developed and the Bureau applied for a patent on the process. A technique was devised to determine rhenium contents of less than 1 part per million in solutions.



*An advanced design of an inert-atmosphere chamber is employed in electrolytic refining of rare-earth metals.*

## *Rare-Earth Researches Productive*

Research on rare-earth metals and compounds continued productive during the year. Stable cerous oxide reduced from ceric oxide was found to be a superior feed material in electrowinning studies. An inert-gas fusion technique was devised to detect small quantities of oxygen in electrolytes, and an ion-exchange method, using polarography and flame photometry, permitted detection of extremely small quantities of impurities in cerium metal. Cerium metal was effectively zone-refined by solid state electrolysis. Lanthanum was successfully electrowon.

New ways were developed to recover yttrium and thorium from domestic thorite ores. Methods for beneficiating low-grade uranium ores and minimizing radioactive pollution of surface waters by uranium mill wastes were improved. Crude scandium concentrate was recovered successfully from uranium mill-waste liquors in a truck-mounted portable pilot plant. Improved chlorination and active-metal reduction techniques produced higher purity thorium metal. Radiological hazards associated with melting and fabricating thorium were determined and safer procedures were devised.

New advances in Bureau secondary metals research included recovering tin from hardhead, purifying lead and tin by vacuum distillation, and using ultrasonics for improved electrodeposition of metals. A gas-fired vacuum retort was designed. A Bureau-developed process for economically reclaiming cadmium and magnesium proved to be a key factor in the sale of Government-owned surplus incendiary bomb casings.

Flotation reagents were studied by absorption spectrophotometry, the better to understand the reactions of flotation processes. Knowledge of chlorine metallurgy was increased by studies on chloridizing base metal sulfides and on the vapor pressure of metal halides.

## *Microbes Aid Metallurgy*

Possible roles of micro-organisms in extracting copper from presently uneconomical low-grade materials were studied further. Technical innovations in the segregation process for treating low-grade mixed oxide-sulfide copper ores were explored. Expanded application of the process would provide low-cost production from presently submarginal ores.

Mining research on ground-control problems in deep mines developed new information on the effectiveness of precast, segmented, and reinforced concrete drift sets; explosively shaped rock bolts for obtaining rapid bolt anchorage; and the factors affecting hydraulic transportation of stope fill. Research on fundamentals of breaking rock with explosives demonstrated that the charge diameter should equal—as nearly as possible—the hole diameter.

The Bureau method for evaluating performance of explosives by measuring strain produced in the surrounding rock was compared with an underwater test used by an explosives manufacturer. Noise abatement investigations proved a Bureau-designed muffler effective in reducing sound generated by a pneumatic drill. Development of ways to measure pressure in rock masses led to the design of instruments that should increase safety and reduce costs in open-pit and

*A device for measuring the stress in walls and pillars of underground mines is used by Bureau researchers at a commercial operation.*

block-cave mining. Theoretical statistical studies led to a new sampling theory, promising better statistical correlation of exploration drilling prediction of ore content than previously achieved.

A new centrifuge, developed and used for photoelastic study of models of open-pit mine slopes, was about to be used to study problems in rock mechanics and achieve more efficient pit slope designs.

### *Nonmetallic Minerals Yield Secrets*

New data on fluorphlogopite developed from research on synthetic mica during 1961. Melting temperature was more accurately determined and a new law was found that governs the twinning of its crystals. Resistivity data on a number of glass-bonded natural and synthetic micas clearly demonstrated the electrical superiority of the

*A small gasoline motor powers a drill used by Bureau of Mines to penetrat permafrost in Alaska's Kuskokwim River area in quest of mercury ore.*

synthetic mica products. Preparation of various synthetic mica and the effect of composition changes on their properties were reported in a Bureau publication.

Samples of reconstituted-mica paper made by the Bureau fron water-swelling synthetic mica were distributed in response to request from the electronic and electrical industries. Investigations on way to improve the properties of this paper continued in cooperation witl the General Services Administration and were to include substitutior of various ions during paper formation, treatment of the formec paper, and changes in composition of the water-swelling mica.

Valuable new information was obtained on special properties o yttrium, lanthanum, cerium, and many rare-earth oxides to aid ir evaluating these materials. Possible new uses for them are as additives to standard high-temperature ceramic materials such as alumina magnesia, and zirconia. Measurement and control of temperature developed by a Bureau-designed image furnace for studying superrefractories were accomplished.

### *Study of Thermal Expansion*

More than 20 government, university, and industry laboratories from three continents collaborated under Bureau leadership in 1961 to study how to measure accurately the thermal expansion of refractories at temperatures up to 3,000° C. The cooperative effort included comparison of results obtained, on a standard sample, using X-ray diffractometer, X-ray camera, dilatometer, interferometer, and telemicroscope methods.

Research on the synthesis of asbestos continued, particularly on the crystalline structure of inorganic asbestiform fibers. Studies were completed on garnierite, scapolite, richterite, and potassium-lead-silicates. Silicon carbide fibers were synthesized both in "cottony" and needlelike fibers. Exploratory experiments proved that the synthesis of long fibers should be feasible.

Preliminary tests of a method of dewatering primary phosphate-rock slime yielded encouraging results. The method may solve a serious problem confronting the phosphate industry in Florida and Tennessee.

### *Fire Clays Upgraded*

Alkali content of subgrade fire-clay samples was reduced more than 50 percent using a Bureau-developed leaching process. Ultrasonic energy proved useful as a pretreatment step in ion-exchange removal of alkali. Research on removal of quartz and pyrite from fire clay continued with excellent results, and an interim progress report was published. The Bureau's wet-attrition-grinding process was further refined and adapted for continuous grinding and produced clay of paper-coating grade in laboratory runs.

Elemental boron samples were obtained by reducing boron trichloride with zinc or lithium and purifying it by melting in an electron-beam furnace. Preparation and testing of sintered compacts of boron continued, and improvements were made in analyzing and measuring techniques. A method of preparing commercial-quality zirconium diboride directly from zircon was described in a report.

One phase of test work was completed and a report was issued on a series of flotation tests of Nevada and California fluorspar ores. Another project was devoted to a process for recovering fluorine from ow-grade sources by defluorinating siliceous fluorspar ores in a rotary kiln and recovering hydrofluoric acid from the gases.

Study of the damaging effects of vibrations from quarry blasting continued. Development of criteria for predicting damage to surface structures was essentially completed and vibration levels resulting from different commonly-used blasting techniques were compared. Research on ground support problems in the Western phosphate field advanced. Precast lightweight concrete supports were designed and built for trial in adits with typical "heavy-ground" conditions.

## *Petroleum and Natural Gas*

The Bureau of Mines research program in petroleum and natural gas during the year resulted in many contributions for conserving the Nation's reserves of these fuels. The laboratory phase of a study of physical properties and clay content of oil sands in the Powder River Basin, Wyo., was completed and preliminary results were published.

Studies completed under this project have shown how the physical properties and clay content of oil-bearing rocks affect the productive capacity of wells. In new studies on the oil and gas sands in the Green River Basin, Wyo., special attention is being given to the Patrick Draw field, a major new discovery and now the largest oil producer in Wyoming.

Two reports were published on a study of well-completions in Naval Petroleum Reserve No. 4, Alaska. This study is of particular interest because 11 wells were drilled into the reservoir rock, part of which is in permafrost which has a temperature below the freezing point of water. Results of drilling the 11 wells on the Umiat structure indicated that the use of the drilling muds containing water, particularly fresh water, lowered the productivity of some of the wells.

Although all the wells penetrated sandstones that contained oi and gas, the highest production rates were from the wells complete with oil and oil-base drilling muds in the holes. Wells drilled wit sodium chloride brines and cable tools had intermediate productio rates. This information is timely because of the drilling progra underway in Alaska and Northern Canada.

Data from computing programs illustrated flow problems for tw fluids, two temperatures of flow, and two flow rates. They sho pressures as a function of time, position in the formation, and flo rate. This information can be applied to problems of removing ga from a reservoir or return of gas to a reservoir for storage.

In particular, it permits estimates of the future delivery capacit of wells under two contrasting sets of circumstances: (1) Assumin that properties of the fluid will never change; and (2) taking int consideration the fact that fluid properties do change as pressur changes and as condensate accumulates in the pores of the structure.

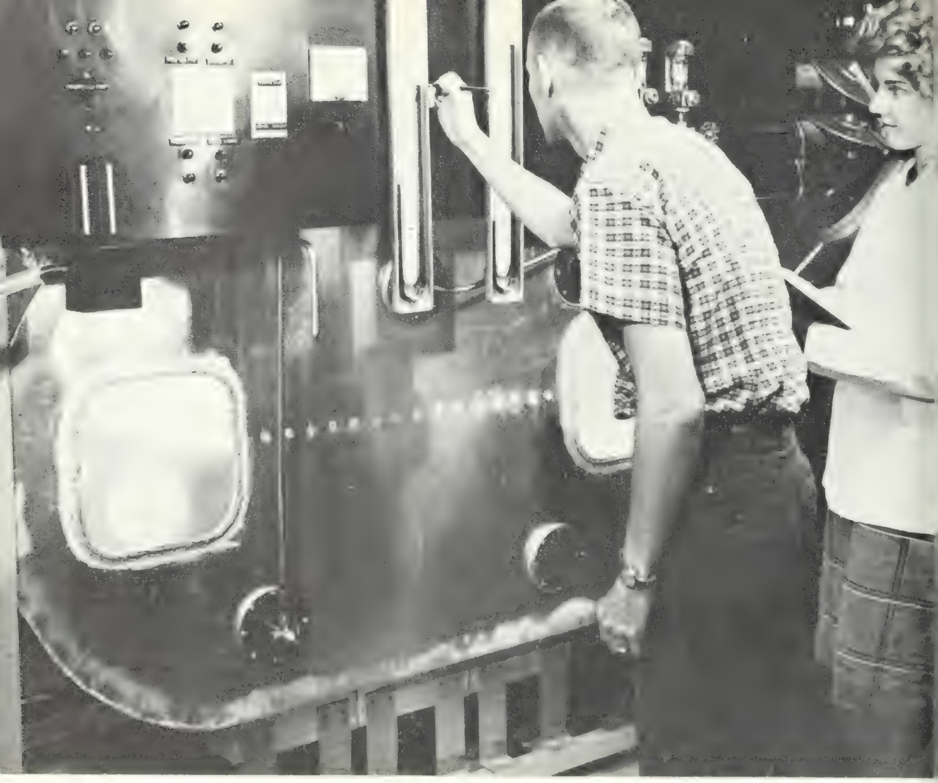
*Water containing radioactive hydrogen is fed by a Bureau of Mines engineer into an Oklahoma oil well as part of a study on secondary recovery of petroleum.*

Research on gas storage resulted in a publication describing back-pressure tests used to measure the deliverability of gas when stored. Laboratory investigation of the effect of silane injection on the capacity of sandstone to transmit gas at various water saturations was completed and the report was readied for publication.

Prompted by the interest of companies in using relatively cheap nert gases as "cushions" in natural-gas storage, the Bureau cooperated with the American Gas Association in starting research on he problem of diffusion and mixing between such a cushion gas and the "operating" gas. Gas chromatography permitted quantitative measurement of diffusion of a nitrogen cushion and natural-gas operating gas through a sandstone core.

## Research Results Published

The use of sodium tripolyphosphate for increasing injection rates n secondary-recovery operations grew during the year from a few ield tests and trial treatments to routine use in more than 100 waterlood operations. Only a few wells failed to develop marked improvement in injection rates after tripolyphosphate was used. Two Bu-



*Smog resembling that found in certain cities is created by the Bureau of Mines in this special chamber as part of its study on atmospheric contamination. Exhaus from an automobile engine is fed to the chamber, mixed with air, and then bathed in special light to simulate sunlight. The result: Eye-irritating smog.*

reau reports were published to describe results from using this chemical.

An outstanding attainment from a study made in California was the determination of organic acid constituents in oilfield waters. The relatively high concentration of such salts appeared to be unique and was characteristic of waters that have been in contact with crude oils in the reservoir rock. This study has helped California operators in their dealings with the State Water Pollution Control Board, which regulates the disposal of oilfield waters.

## *Storage Tests Yield Information*

Five petroleum product survey reports, based on facts submitted by oil companies, were published. They included two reports showing inspection data on motor gasolines and one each on aviation, diesel, and burner fuels marketed in the United States.

Gasoline and other distillate fuels often form undesirable products such as gum, when stored. Fifty-two weeks' storage tests at 110° F

*This equipment is being used by the Bureau of Mines in one of its several studies n air pollution. The instrument-filled station wagon is used to analyze exhaust umes from the vehicle itself as it travels and to test the effectiveness of catalysts n removing contaminants. The trailer is a generating unit that provides power or the instruments.*

showed that several commercial-type hydrogenated fuels were as stable as untreated fuel. On the other hand, a blend of unhydrogenated material formed more than eight times as much gum as a similar hydrogenated blend. Storage studies on a gasoline showed that sulfur and nitrogen compounds contribute markedly to the formation of gum.

In air-pollution research, a cooperative project with the Public Health Service dealt primarily with study of composite automobile exhausts produced during a series of accelerations, decelerations, and cruise and idle operations to simulate traffic conditions. Analyses of composite samples showed a consistent relationship between composition of the exhaust and that of the fuel.

Studies on the use of catalysts to eliminate hydrocarbons from automobile exhausts revealed that uranium oxide alone has limited activity but when promoted with chromium and copper is much more effective.

### *Gas Chromatographic Unit Designed*

A new gas chromatographic unit was designed and construction was nearly complete. The unit is designed specifically for isolation and identification work in crude oil analysis where complete separation of complex samples is needed. A molecular still, constructed to distill a barrel of oil at low pressures and temperatures, was modified and was tested successfully.

A method was developed to use rotating-bomb calorimetry for measuring the heat of combustion of organic silicon compounds, a class of substances for which all methods previously used in other laboratories had been unsuccessful. To calculate values of heat of formation from the results, values of the heat of formation of fluosilic acid were needed. These were developed by a novel method. Thus, the thermochemistry of organic silicon compounds is now on a firm experimental basis, fulfilling a need for more and better thermodynamic data that has become especially apparent in research and development of new missile fuels and rocket propellants.

The Bureau completed a publication containing comprehensive thermodynamic tables for 100 petroleum sulfur compounds.

## *Oil Import Administration Aided*

The Oil Import Administration continued to base policy formulation and administration of controls upon reliable petroleum statistics provided by the Bureau. At the request of the petroleum industry, supply-demand balances by districts on the Oil Import Administration basis were published each quarter. The use of Bureau forecasts, prepared twice yearly, was extended to become the basis upon which over-all residual fuel oil import quotas were determined.

## *New Facts Gathered on Oil Shale*

Investigations of samples from the potentially important oil-shale beds in the Piceance Creek basin in Colorado disclosed that the specific gravity of oil recovered from this source decreases with increasing depth in a uniform manner.

Preliminary studies on black oil shales of the eastern United States revealed a lack of similarity in chemical and physical properties. Considerable interest in these shales has developed because gas can be produced from them by hydrogasification process and because they occur near major market areas.

The possible use of depleted uranium as a catalyst for increasing octane ratings of gasoline or for hydrogenating shale oil was examined. Yields of gasoline from hydrogenated crude shale were not as good with depleted-uranium catalysts as with other catalysts, but octane numbers of gasoline obtained with depleted uranium were higher.

## *Health and Safety Activities*

Background information obtained under actual mining conditions n gassy coal mines proved particularly useful in the Bureau's development of a practical methane-monitoring system. A notable advance occurred in safety-education with wide use of the course of nstruction for supervisors emphasizing psychological approaches to accident prevention.

Research on primary hazards developed better methods of face ventilation with continuous miners; roof-bolting and roof control methods were improved; the hazards of float-coal deposits were investigated; new and modified mining equipment was approved in accord with Bureau permissibility standards; and experimentation continued in coal-mine-fire control.

The mining industry suffered one major disaster in fiscal 1961—an explosion in an Indiana coal mine—matching the major disaster record of the preceding year.

### *Primary Hazards Attacked*

Research on face ventilation included a pioneer study of a small blower, complete with duct work, mounted on a continuous mining machine in an operating gassy coal mine.

Reports, complete with recommendations, were submitted on five coal mines and two noncoal mines after extended ventilation surveys. Several complicated ventilation problems were solved with the aid of an electric analog.

Experiments continued with a commercial prototype of an articulated, self-propelled roof shield—designed by Bureau engineers—in a mechanized Pennsylvania bituminous coal mine. Time studies showed safety and efficiency would be gained with two shields in a working section. The mine operator then acquired a second shield, embodying improvements.

A smaller, more compact, sonar device for exploring structural characteristics of mine-roof strata was being constructed as the year ended. Advanced electronic circuits and modern transistors will make the unit portable and safe for use in gassy and dusty coal mines.

### *Roof-Bonding Evaluated*

Roof-bonding experiments to eliminate caving of fragile roof at intersections in a West Virginia coal mine were evaluated. A combination of roof-bonding and bolting was studied for consolidating highly fractured ground in noncoal mines.

Unpredictable, sudden roof failures in a Pennsylvania coal mine were investigated to determine whether this condition was related to gas or hydrostatic pressure in the overlying strata and to develop remedial measures to prevent similar occurrences.

Major roof-bolting research efforts were directed toward improving materials, developing basic data on the functioning of installed roof bolts, designing methods to determine stability of bolted mine roof, and developing devices to insure safe and efficient roof-bolting installations.

Research progressed on a "penetrometer" to determine the anchorage capability of roof rocks "in situ" at the anchorage horizon of a roof bolt. Equipment was tested in the laboratory to study the effect of dynamic loading on roof-bolt anchorages before redesign for underground tests.

## *Float-Coal Hazards Assessed*

Investigation of the explosion hazard of float-coal deposits began in the Bureau's Experimental Coal Mine. Because of their fineness and tendency to form surface layers, float-coal deposits present a greater hazard than normal mine dust in return airways. Danger from light deposits can be neutralized by generalized rock dusting but more effective protective measures are required with heavy float-coal deposits, particularly when a weak gas explosion is the igniting source.

Efficiency of fire-extinguishing agents and techniques of their application were tested by using them on a simulated burning mining machine. Visibility and approachability were determined to be the primary factors affecting rapid control of underground fires. Water containing an alkali-metal salt or wetting agent was found more effective than plain water. Liquids applied as fog were most efficient, but solid stream application was best when close approach to a fire was possible. Use of new Bureau-developed equipment to force high-expansion foam to a fire from a remote location eliminated the brattice cloth (deflecting) curtain otherwise needed to provide fresh air in approaching a fire in a dead-end entry.

Investigation of methane-monitoring systems continued. A commercial bimetallic switch was modified for operation by a catalytic pellement (Bureau name for a platinum filament pelletized with alumina and coated with a catalyst). Two switches were used in a system. The first switch, when methane concentration reached 1 to 1½ percent, actuated a visual or audible alarm. The second switch, at a methane concentration of 2 to 2½ percent, operated a relay to shut own mining equipment. A recording methane detector was developed and was used to aid in evaluating performance of such experimental systems.

## *Field Trials for Methane Detectors*

Field trials of both monitoring and recording methane detectors were made in three operating commercial coal mines. Monitoring detectors were mounted on mining machines. Recording detectors were connected to a two-channel meter to give a continuous graphic record of variations in methane concentration. All equipment worked well, seemed unaffected by working conditions, and gave encouraging results.

Experience from these field trials later proved invaluable in an investigation of gas generation and behavior following a gas explosion in an Indiana coal mine.

## *New Mining Equipment Tested*

Industry continued to improve mechanized mining equipment during the year, thus increasing demands on the Bureau for technical assistance and testing to determine permissibility or acceptability of all types of electrical and diesel-powered devices.

During fiscal 1961, Bureau approvals were issued covering the designs of 20 shuttle cars, 13 loading machines, 5 conveyors, 2 distribution boxes, 1 loading station, 4 face drills, 5 utility trucks, 5 conventional mining machines, one 20-shot millisecond delay blaster, 19 continuous mining machines, 1 water spray pump, 3 rock dusters, 2 roof bolters, 1 timber setter, 2 air compressors, 1 mine pump, 1 hydraulic continuous miner, 1 portable blower, 1 air-velocity monitor, 1 miniature methane detector, 1 diesel-powered transloader, 3 diesel locomotives, 3 diesel ore carriers, 3 diesel-powered crawler tractors with shovels, and 1 diesel-mechanical shuttle car. Formal approvals totaled 167 and 1,235 informal extensions of approval were issued for electrical-mechanical equipment.

Explosion-tests were given 101 compartments and 3,326 tests were made in explosive mixtures of natural gas and air. Flame tests were run on 17 conveyor belts and 15 cable samples.

Nineteen approvals and 10 extensions of approval were issued for roof drills with integral dust-collecting systems. Sixteen approvals and 157 extensions of approval were issued for respiratory-protective devices. Five of the 16 were of filter-type paint-spray respirators, first of their type to meet Bureau standards.

*Radiation hazards in uranium mines were studied by the Bureau of Mines in cooperation with the Public Health Service. A Bureau engineer (right) collects radon-daughter products from the atmosphere.*

Service to the mining industry was advanced by adoption of regulations for testing and for approving as permissible mobile diesel-powered transportation equipment for gassy noncoal mines and tunnels.

## *Silicosis Problem Evaluated*

The Bureau's program to promote healthful working conditions in the mineral industries emphasized work on gases, dusts, and respiratory-protective devices.

Environmental surveys were coordinated with medical studies by the Public Health Service to evaluate the silicosis problem in metal mining. Since starting this program in April 1958, 59 surveys of work environment, affecting approximately 20,000 employees of representative underground metal mines, have required collection and examination of more than 17,000 airborne-dust samples. The surveys still are underway.

In uranium mines, studies began to determine the full-shift, weighted-average exposure of workers to alpha-emitting decay products of radon. Resulting information was correlated with results of "spot" samples ordinarily collected during regular inspections. Investigations and inspections in these mines continued to evaluate health and safety hazards other than radioactivity. The Bureau cooperated closely with the Public Health Service, the Atomic Energy Commission, and the Federal Radiation Council in developing recommendations for evaluating and controlling radiation hazards in uranium mines.

About 21,000 atmospheric samples were analyzed in three gas-analysis laboratories during the year. Most were collected during Federal coal-mine inspections but other sources included inspections of uranium mines, fire seals in underground coal mines, environmental surveys in noncoal mines, underground construction operations at power projects, missile sites, tunnels, and laboratory investigations.

Facts were assembled and performance studies were made on portable, colorimetric, tube-type gas detectors to assess their usefulness in estimating concentrations of certain mine gases. A nondispersive infrared gas analyzer was acquired to aid in determining low concentrations of carbon monoxide in air containing varying concentrations of methane. Infrared-absorption spectrometry was applied to qualitative and quantitative analyses of a variety of gas-air samples.

Dust concentrations or particle-size distributions were determined from 700 samples of airborne dust obtained during environmental surveys in metal mines, three dust surveys in coal mines, performance testing of roof drills with integral dust-collecting systems, and laboratory studies on dust sampling and evaluating techniques. To ascertain the general composition of dust breathed by workmen—with particular reference to free silica—about 250 samples of solid materials were analyzed by X-ray diffraction and emission spectroscopic methods.

## *Tunnel Workers Receive Special Training*

Further laboratory-type and field tests in the medical lock of a tunnel being driven under compressed air improved the Bureau's technique for using 2-hour, self-contained, oxygen-breathing apparatus in air pressures greater than normal. Several employees of th tunnel contractor were trained in this highly specialized techniqu the first such Bureau training ever to be given.

Apparatus was assembled and tests were started on two types o aerosol for evaluating the performance of respirators designed fo protection against highly toxic dusts and fumes. One aerosol wa a solid fluorescent material (uranine) and the other was fine liqui or "smoke" particles (dioctyl phthalate or DOP).

## *Additional Instructors Trained*

The Bureau training course on fundamentals of accident prevention for coal-mine supervisors stimulated increasing interest. Additional instructors were trained and equipped to further thi educational activity and enrollment was more than twice that of th previous fiscal year.

During fiscal 1961 the Bureau's various accident-prevention course were completed by more than 6,300 mineral-industry workmen an officials. The fatality rate was markedly improved in uranium mine in the vicinity of Grants, N. Mex., after the course, "Metal-Min Accident Prevention," was completed by 300 supervisors and ove 200 other employees.

Thirty thousand workers completed first-aid and mine rescue training as emphasis continued on 100-percent employee participation.

Three new safety motion-picture films as well as slides, posters, an other visual aids in safety education were produced during the year. Films in the Bureau's safety series were viewed by 140,000 mineral-industry workers; and lecture-demonstrations of fire, explosion, and mine-gas hazards were attended by more than 100,000.

Over 600 chapter and council meetings of the Holmes Safety Association, sponsored by the Bureau, were attended by more than 26,000 workers, mostly coal miners.

## *Thousands of Workers Honored*

The Bureau continued its effort to determine which areas of the mineral-extractive and related industries require special emphasis on accident prevention. It collected, compiled, and published injury and employment data voluntarily supplied by operators in the mining and quarrying industries throughout the United States. To comply with the Federal Coal Mine Safety Act, statistics on coal-mine injuries and fatalities and related information were published monthly

*rposely set fire in Bureau's experimental mine is fought with water during search on reducing hazards in coal mining.*

ıd annually. Similar information was published annually for dustries other than coal.

More than 1,200 mines, quarries, and plants were enrolled in the 3th National and other safety competitions conducted by the Bureau ı cooperation with industry associations. Some 3,000 employees and ficials of operations that won safety honors were awarded Certificates f Accomplishment in Safety.

## *ıactive Coal-Deposit Fires Controlled*

During fiscal 1961 13 fire-control projects were completed, in the public domain, 2 on Indian-reservation land, and 9 on priate property. Control work on six of these fires was started durıg fiscal 1960. Work was in progress to control or extinguish nine ther fires, two in the public domain, and seven on private property. ne of the latter is near Lloydsville, Westmoreland County, Pa., where n experimental fire-control method involving surface sprinkling is being investigated. Experimentation with this method is to be continued during fiscal year 1962.

With Bureau guidance, 93 fires in inactive coal deposits have been extinguished or controlled since 1949, when funds were first appropriated for this purpose. Of these fires 49 were in the public domain Indian lands, or in other properties where Federally owned coal wa endangered, and 44 were on private property. Most of the latter wer in residential areas. Under this program an estimated 308 millio tons of coal has been conserved, about three-fourths of which is Federally owned.

The Bureau knows of 217 other uncontrolled fires in inactive coa deposits. Of these, 110 have been investigated and their control i to be undertaken as money permits and as private matching funds ar available where such funds are required. Maintenance work has been done, as necessary, on completed projects to keep fires from rekindling

## *Federal Coal-Mine Inspectors Busy*

The ninth full year of coal-mine inspection under the Federa Coal Mine Safety Act was completed. Title I of the Act authorize the Bureau to enter and inspect coal mines, report on hazards, an recommend (but not require) their correction. Title II of the Ac contains specific enforcement provisions designed to prevent explosions, fires, inundations, and man-trip and man-hoist accidents i mines regularly employing 15 or more men underground.

Of 10,454 active coal mines recorded during the year, 1,094 wer classed as title II mines. The remainder, 7,581 small undergroun mines, 241 auger mines, and 1,538 strip mines, were classed as title I mines.

During the year, 2,681 routine inspections were made of coal mine subject to title II. In addition, special followup inspections wer made to determine whether previously cited violations of mandator provisions had been abated.

Federal mine inspectors observed 7,606 violations of the mandator safety provisions, many of which were corrected immediately an thus required no formal action. They issued 1,043 notices setting reasonable time for abating dangers, 180 notices granting time extensions, and 1,004 notices certifying that dangers had been totally abated

## *Withdrawal Orders Issued*

During the year, 118 orders were issued requiring withdrawal o men from all or part of 73 mines; 65 orders at 49 mines were issue ecause of imminent danger, and 53 at 24 mines were issued because of ilure to abate violations within a reasonable time. By comparison, 1 withdrawal orders were issued at 58 mines during the previous ear. Orders were issued classing as gassy 14 mines previously con- dered nongassy.

One appeal was made to the Director for annulment of a gassy- assification order issued under Sec. 203(d) of the Federal Coal Mine afety Act. The Director denied this application, and his decision as appealed to the Federal Coal Mine Safety Board of Review—an dependent tribunal set up under the Act.

Federal inspectors and engineers also made 10,928 routine inspec- ons of title I mines (including 1,224 inspections of strip mines and 61 inspections of auger mines) and numerous additional roof con- ol, electrical, ventilation, dust, blasting, and related surveys and vestigations of fatal and serious accidents, mine fires, gas and dust nitions, and miscellaneous conditions.

Preliminary reports show 323 coal-mine fatalities in calendar year 960, compared with 292 in calendar year 1959. The fatality-fre- uency rate per million man-hours of exposure increased from 0.98 1959 to 1.16 in 1960. The fatality-frequency rate for the first months of 1961 was 1.36. One major (5 or more persons killed) oal-mine disaster occurred in fiscal 1961—an explosion in an Indiana ine in which 22 men lost their lives.

A Bureau survey showed that fire-resistant hydraulic fluids now re being used in approximately 100 coal mines, ranging from 100 ercent use to experimental installations. The Bureau has pioneered n studies of this safer material and encourages the use of fire-resist- nt hydraulic fluid as a mine-fire preventive measure.

## *Bituminous Coal Activities*

Bureau of Mines research in bituminous coal was conducted in a ontinuing effort toward wise conservation of this valuable natural esource through improved methods of mining, preparation, process- ng, and utilization. Significant achievements occurred during the iscal year in all phases of the work.

In studying the effectiveness of high-pressure water jets to extract oal from the solid, the Bureau mounted a hydraulic monitor over he conveyor of a conventional loading machine. This permitted a nore continuous mining cycle when operating in a flat-lying coalbed. To achieve better control of the hydraulic mining operation, a test aboratory was built underground to determine nozzle efficiency and et-flow patterns.

A portable recorder was developed to measure continuously the release of methane at the face of gassy mines. This unit operates o battery power, thus eliminating the need for mine electricity bein brought to the instrument and also making the instrument useful a many additional places in a mine.

Examination of a magnetic product obtained from a fly ash demonstrated its suitability for use as a dense medium in coal-washin and ore-dressing processes. Experimental work at the pilot-plan level indicated that the spherical shape of the magnetic particles an their exceptional purity would be advantageous under some operatin conditions encountered in commercial plants.

## *Chemicals Field Emphasized*

Seeking to understand better the ultimate structure of coal, ultrathin sections of coals of all ranks were prepared having a thicknes of 2 to 8 millionths of an inch. These extremely thin sections ar particularly suitable in studying coal properties and structures wit modern techniques such as electron microscopy, electron diffraction and ultraviolet-visible and infrared spectroscopy.

Possible processes for producing industrial chemicals from bituminous coal were evaluated. Using these facts, researchers bega studying the production of hydrogen cyanide from coal or char.

The Bureau attempted to strengthen coal's position in the energ market by reducing the costof transportation. One phase was construction of an experimental hydraulic transport system. Powe requirements, speed of moving coal, and size degradation were studied Coal up to 2 inches was used.

In a continuing search for better methods for analyzing coal, th Bureau developed a procedure for determining the major constituents in coal ash. This proved to be quicker and nearly as accurat as so-called "classical methods."

## *Road Paving Examined*

The use of a mixture of bituminous coal and petroleum asphal for paving roads was evaluated in the laboratory. Test strips o a Government-owned roadway are being laid to check the laboratory findings.

Using the principle that certain bacteria will accelerate the oxidation of iron in pyrites, the Bureau discovered a microbial method fo desulfurizing coal. In the presence of iron-oxidizing bacteria, 50 t

0 percent of the pyritic sulfur in the coal was removed in 96 hours. Organisms capable of using organic sulfur also were found for studies on microbial elimination of organic sulfur from coals.

The effect of gamma irradiation on coal structure and properties was explored. The Bureau determined that little significant change occurs as a result of irradiation. With the coal, a decrease in coal solubility in pyridine was noted and with another coal the irradiation caused a shift in the X-ray diffraction pattern and produced an increased evolution of gas on vacuum pyrolysis.

## *Small Helium-Heated Gasifier Built*

A laboratory-scale helium-heated coal gasifier was operated to demonstrate that coal can be gasified by recycled helium. The process required the helium to be heated to high temperatures. In the future, nuclear sources might be used to supply the necessary heat.

The feasibility of the fixed-bed gasification process for lignite, using oxygen, was definitely established for operating pressures of 80 pounds per square inch, gage. Lignite char, steam-dried lignite, and natural ignite were used successfully as fuel. Since satisfactory operation of the gasifier is assured at the 80-pound-pressure level, the equipment s being modified to demonstrate the full commercial advantages obtainable: high capacity, moderate oxygen consumption, and excellent steam decomposition.

## *Bituminous Coal Information in Wide Use*

Production of bituminous coal and lignite continued downward for the fourth successive year, despite increases in the national demand for energy. At year's end, output began moving upward, largely because of shipments to electric power utilities. Special analyses were prepared, in the form of bituminous coal and lignite distribution studies, to delineate changes in coal-marketing patterns as related to coal's changing position in the competitive energy market.

Comprehensive information was assembled and published regarding the changing picture of international coal trade, particularly as influenced by significant shifts in other countries to competing fuels, and indications of increasing availabilities of oil and natural gas to Western Europe from Middle East and Iron Curtain countries. Detailed information was supplied to other Federal agencies on coal developments at home and abroad and for determining the role of solid fuels in mobilization planning.

## *New Explosives Schedule Developed*

A new schedule (1–H) for testing explosives to determine thei permissibility for use in underground coal mines was published. I included a new gallery test based on a statistical design whic represents a major change in explosives testing. An investigatio of stemming materials showed that water or common salt is mor effective in reducing the incendivity of explosives than correspondin weights of fire clay. Noise-control studies have provided much ne information regarding the relationship between meteorological conditions and sound transmission through the air.

Problems created by the recent use of low-cost ammonium nitrate fuel oil blasting agents in some underground mineral and metal mine were investigated. Included are problems of air loading, priming electrical hazards, and fumes. Cooperative research with other Government agencies yielded valuable new information on phenomen in detonating gas mixtures and the mechanism of the initiation o detonation in liquid explosives.

Investigations conducted for other Federal agencies on flames an massive fires are providing useful criteria for developing new procedures for combating catastrophic fires and for the handling of som of the new missile fuels. Also, the fire hazard of liquefied natura gas was found to be surprisingly similar to that of gasoline.

Several accidents involving fires, explosives, and explosions wer investigated. Potentially hazardous situations involving flammabl materials also were studied.

## *New Facts on Air-Pollution*

The Bureau remained active in the Federal air-pollution progra In cooperation with the Public Health Service under Public La 84–159, research centered on the automobile as a source of urba air contamination. Fuels-exhaust composition relationships were determined further through development and application of improve exhaust sampling and analysis techniques.

Research shed new light on conditions under which hydrocarbo and carbon monoxide exhaust components can be reduced to acceptably low levels. Studies were continued to develop economic way to abate the sulfur dioxide nuisance that sometimes results when larg industrial furnaces burn sulfur-bearing fuels.

Ways to use depleted uranium as an automotive exhaust oxidatio catalytic agent were studied in cooperation with the Atomic Energ Commission.

## *Anthracite*

Studies by the Bureau during the year stressed ways to develop markets for anthracite, better preparation practices, and improved methods. The Bureau also continued its functions under the joint Federal-Commonwealth of Pennsylvana mine-water-control program.

Fundamental research included identification of products obtained by nitric acid oxidation of anthracite and the development of a technique for determining the electrical resistivity of anthracite. An apparatus was assembled for studying the surface properties of anthracite.

A cell containing approximately 23,000 curies of Cobalt 60 was installed at the Anthracite Research Center during the year. Research underway with the unit includes the effect of gamma radiation on the reactions that occur when anthracite is irradiated with other materials (oxygen, hydrogen, steam, carbon dioxide, sulfur, chlorine, and fluorine) at various temperatures and pressures. This work should determine if gamma radiation promotes reactions that result in the formation of compounds of possible commercial value.

### *Briquets Tested in Blast Furnace*

Special briquets produced during the year will be calcined and then tested in the Bureau's experimental blast furnace. The Bureau of Mines and the Bethlehem Steel Company agreed to extend pressure-drop studies of different sizes and shapes of anthracite briquets and other burden materials in the Bureau's experimental stock column to determine optimum operating conditions. Preparation studies consisted largely of tests with cyclones to determine their efficiencies in desliming and deashing anthracite fines.

A prototype hydraulic mining system was designed and was installed in a mine of a cooperating company. Hydraulic mining experiments were scheduled to begin. Information on the performance of the equipment will be used to determine the feasibility of using water for mining anthracite.

Work continued in developing a workable system for the vertical-hydraulic-transport of coal in pipelines. A pilot-size unit at the Anthracite Research Center received preliminary tests and minor design revisions were made.

### *Mine Workings Surveyed*

Studies are being made for the Corps of Engineers to determine structural conditions and the extent of mine workings in various beds beneath and adjacent to channels of the Susquehanna River and it major tributaries.

Activity of the joint Federal-State Anthracite mine-water contr program continued at a slow pace. Only three control projects, costing a total of about $400,000, were approved for Federal participatio during the year.

Economic and statistical surveys included information on production by type of mining, consumption, distribution, stocks, minin equipment, and the competitive relationship of anthracite to othe fuels.

## *Public Reports*

Bureau of Mines scientists and engineers added considerably t scientific literature in fiscal 1961 by writing a record 791 manuscripts Their varied fields covered thermodynamics, metallurgy, minin methods, explosives testing, research in helium, petroleum, and coal and other work concerning conservation and development of mineral and the saving of life. Among these were 309 reports for publicatio outside the Department.

Bureau publications issued included 202 reports of investigation on original research, 91 information circulars on new developments i industry, 7 bulletins giving results of completed programs or describing major phrases of continuing research, and an up-to-date editio of the popular three-volume Minerals Yearbook. In honor of th Bureau's 50th anniversary, two special volumes were issued listin separately all the official Bureau publications and all journal article and other material prepared for the outside press from July 1, 1910 to January 1, 1960.

### *Bureau Films Seen by Millions*

The industry-sponsored motion-picture program of the Burea retained its nationwide popularity throughout the year. Informational films in sound and color, telling the story of America's mineral heritage and potential, were shown 214,000 times, and were seen by 11,400,000 people in group audiences. Approximately 12,000 reel were in circulation during fiscal 1961.

Recent Bureau film releases received artistic and scientific recognition. "California and Its Natural Resources" received the 1961 Award of Outstanding Merit at the 12th Annual National Film and Filmstrip Competition of Scholastic Teachers. "The Magic of Sulphur," a revision of a highly popular Bureau subject, was selected y the U.S. Committee on Visual and Auditory Material of the .S. Information Agency to compete in the Sixth International cientific-Didactic Film Festival held in 1961 at Padua, Italy. "Alaska and Its Natural Resources" was selected for entry in the 5th Edinburgh International Film Festival in Scotland.

The films on Alaska and Sulphur were added to the Bureau's film brary early in 1961. "The Magic of Sulphur" is an all-new version f a subject that has ranked high with Bureau audiences for more than 30 years. "Alaska and Its Natural Resources" is an entirely ew motion picture. At year's end, four new films were in production nder standard industry cooperative agreements. The motion pictures deal with copper, potash, synthetic rubber, and phosphorus.

During 1961, new methods of distribution were undertaken in the ducational television field. Station WQED, Pittsburgh, Pa., began pioneering series of telecasts, based wholly on Bureau films. The eries, developed as a unified educational program, was entitled, "Down to Earth," and was part of WQED's "Summer High School f the Air."

## *Foreign Activities*

Evaluation of mineral developments abroad for their effect on the lomestic mineral economy continued as an important function of the Bureau. The principal attainments in fiscal 1961 were: compilation of world production and international trade statistics for the Bureau's Minerals Yearbook; preparation of 13 special analytical reports on foreign minerals of which 11 were published, including summary of the mining and petroleum laws of the world, the only tudy of its kind ever issued in a single volume; servicing a thousand equests for information from the public and other Government gencies.

Recognizing the worldwide nature of progress in science and echnology, the Bureau cosponsored an International Symposium on Mining Research with the Missouri School of Mines at Rolla, in February 1961. Over 300 delegates from 55 countries presented 51 papers which greatly enriched the technical literature in this field.

The Bureau's latest summary of world mineral production revealed ew peaks which reflected demand arising from population growth nd rising standards of living. Rapid advances in atomic and space echnology show that a greater variety of mineral products is required nd that research to utilize marginal deposits should be intensified.

The United States and the free world maintained an overwhelming ead in mineral production, but the Sino-Soviet Bloc was narrowing the gap. In recent years Russian gains have been less impressive but since 1953 Communist China has moved from 7th to 3d plac in coal production and from 16th to 7th place in steel. The Bureau' studies showed that Red China is striving for still higher objective and possesses the mineral resources to support them. By standard prevailing in the West, however, communist overall performance i inefficient. Consequently, communist gains in mineral production di not represent equivalent gains in industrial strength.

### *Soviet Petroleum Experts Visit*

The Bureau's foreign activities included exchanges of informatio with mineral groups in other parts of the world. During the pas year, the Bureau participated in an exchange of visits by petroleum experts from the United States and the U.S.S.R.

The Bureau's antarctic program was handicapped by unusually ba weather during the 1960–61 austral summer. Nevertheless, early i the season a Bureau engineer discovered major deposits of coal o good quality near the head of Mackay Glacier. Adverse weathe prevented a return for more detailed study.

Foreign technical assistance was conducted in cooperation with th International Cooperation Administration by thirteen Bureau technologists on long-term assignments in Afghanistan, Indonesia, Korea Laos, Mexico, Nepal, Pakistan, Peru, and Taiwan. Three othe engineers completed short-term assignments in Malagasy and Mexico Fifty-three foreign technicians from 16 countries received training at Bureau installations during fiscal 1961.

## *Mineral-Resource Activities*

Results of 23 mineral-resource examinations and surveys, studie of mining and milling methods and costs, and investigations o mineral economic problems were published by the Bureau of Mine during the year.

Among the more important mineral economic investigations reported was a comprehensive analytical study of the iron and steel scrap industry in California and Nevada. This study was widely acclaimed by industry and Government as an outstanding contribution to the understanding of scrap-metal economics. Other significant projects completed, but not yet published, were a study of the Pacific Northwest steel industry and an analysis and projection of the future of Alaska's mineral industry.

Mineral-resource examinations and surveys covered a wide range of ommodities, including coal, mercury, beryllium, low-grade iron and ickel ores, clays, barite, and titanium. Several of the investigations ere conducted in cooperation with State agencies.

### obile Laboratory Used

The nationwide search for beryllium required the use of several nique instruments for testing rock samples quickly. These included mobile spectroscopic laboratory and a beryllium-detection device sing a radioactive source.

The Bureau's investigation of the Beluga Coal Field, near Anchorge, Alaska, continued. Diamond drilling indicated a potentially rge deposit of special interest as a possible source of low-cost coal or on-site production of electric power.

A popular report on the petroleum and natural-gas fields of Wyoing was published during the year. It contains maps and individual indings for 271 fields, together with analyses of oil, gas, and water amples.

Mining and milling methods and costs studies were made at asbestos, opper, iron, lead, stone, and uranium mines.

Bureau of Mines personnel participated in preparing a report on he economic development of the northeastern Minnesota iron-mining rea, a region that has suffered from persistent and substantial nemployment.

Possible participation in the rapidly expanding Federal Oceangraphic Research Program was planned. Ocean bottom samples vere examined mineralogically, contacts were made with university ceanographic departments, and sampling methods were observed luring a short voyage off the coast of southern California and Mexico.

## River Basin Activities

Water, as a mineral, is as important to industry as it is to all life. More attention is given each year to water problems, even in the "well-watered East," in accord with the "multiple-use concept." The mineral industry, in areas of previously plentiful supply, is increasing recirculation and reuse to lessen its total water demand. Sediments and other pollutants increasingly are being extracted from mineral-plant effluents. Water-conservation agencies are beginning to recognize the desirability of maintaining mineral resources in production in reservoir sites rather than condemning them to perpetual inundation. In all these fields during 1961, the Bureau of Mines served as consultant and adviser in furthering the Nation's interest in multiple efficient use of its resources.

Assistance and guidance by the Bureau of Mines were used directl for the first time during preauthorization negotiations which resulte in an agreement between the Bureau of Reclamation and the Pur Oil Company. Its terms will permit the oil company to retain an exploit mineral rights under the Norman Reservoir in Oklahoma Wise uses of underground mineral resources, along with developmen and use of surface water resources, were assured.

Mineral engineering and consulting and investigative services wer supplied other Federal agencies, many during early planning stages Agency engineering reports reviewed included 40 for the Federa Power Commission, 54 for the Corps of Engineers, 55 for the Soi Conservation Service, and 9 for the Bureau of Reclamation. Informa field-level reviews not included in these totals were numerous. Specia mineral reconnaissance surveys and reports were completed for th Bureau of Reclamation for 11 proposed reservoir sites to evaluat possible mineral involvement. Others are in progress.

A mineral-potential report completed on northwestern California—rich in resources but sparsely populated—aided in estimating that area's future water needs and establishing a base to compute exportable water needed desperately elsewhere.

### *Missouri River Basin Studies*

Mineral resources in three Indian reservations in the Missouri River Basin were evaluated for the Bureau of Indian Affairs. Mineral reconnaissance surveys in six of the Reclamation Bureau's proposed reservoir sites in the basin were completed.

Field and laboratory studies of canal-lining materials were made in six irrigation districts where seepage is a problem. Preliminary basic research indicated that seepage can be reduced when certain canal-lining minerals are impregnated with a dilute solution of sodium carbonate or other water-soluble salts. Feasibility of the method for actual field use was about to be evaluated as the fiscal year ended.

To stockpile lignite is difficult because of its tendency to ignite spontaneously. A progress report was issued on the efficiency of the Bureau's storage method, proved by long-range tests to be exceptionally competent. Manuscripts were written on pulverization tests of North Dakota lignite and on raw materials for chemical industry in Montana.

# *Office of Oil and Gas*

**Jerome J. O'Brien, Jr.,** ***Director***

The Office of Oil and Gas, a staff agency, has in the daily performance of its duties been a focal point for guidance and information to Federal agencies, Congress, and the public on petroleum and gas resources and their utilization in peacetime and the problems of mobilizing for defense in the nuclear age.

Technical assistance rendered to NATO through its Petroleum Planning Committee and Working Group achieves coordination of U.S. defense planning with the NATO countries. For the first time, the PPC met in the United States in April 1961. At the sessions in Washington, D.C., OOG officials were members of the U.S. Delegation and reported on progress in U.S. petroleum and gas mobilization planning. As U.S. delegate at two other meetings held in Paris, France, during September 1960 and June 1961, an OOG executive served as petroleum adviser and participated in the work of the Working Group.

OOG provided an adviser to the U.S. Representative at meetings of the Oil Committee of the Organization for European Economic Cooperation held in Paris in June 1961, and furnished assistance in studies of the Committee.

## *Historical Petroleum Summaries Developed*

To increase the utility of information in the Office of Oil and Gas on worldwide petroleum developments and the foreign supply and demand complex, OOG has nearly completed historical summaries for the years 1955 through 1960 covering crude oil production, refinery throughput, and demand for each of the principal petroleum proc ucts. Data have been gathered, evaluated, and recorded for both th Eastern and Western Hemispheres, including 105 countries and gec graphic areas.

With this basic information as the foundation for projections an with occasional help from the oil industry, OOG has been able to ai the Department of Defense in its military planning for petroleur supplies, and to advise other agencies on oil matters. Twelve classi fied studies involving free world oil supply and demand problems and the ability of industry to produce existing and new types of fuel in the volumes and at the locations required by the military wer completed this year for the Department of Defense. Eleven report were also developed for the Department of State. These data hav expedited the work of OOG in complying with general requests fo information.

### *Domestic Preparedness Stressed*

Further intensive study of the United States petroleum position an prospects was continued and new information developed in suppor of an informed view of long-range petroleum and gas problems. Lat in the year, OOG representatives participated in interdepartmenta conferences whose object was to advance the formulation of polic statements relative to oil and gas in the interest of national security

As a delegate agency of OCDM, the Office of Oil and Gas has bee engaged in improving its plans for handling domestic petroleum an gas resource and supply problems in an emergency. During th fiscal year the Petroleum and Gas Unit of the National Defense Executive Reserve has been doubled to 84 reservists for the eight regiona areas of the United States.

These men, possessing technical know-how and ability to discharg the duties of key positions in an emergency petroleum and gas agenc at the regional level, would be available for full-time Government employment in time of national crisis. This year, training included participation in civil defense exercises and in briefings concerning the National Plan for Civil Defense and Defense Mobilization regarding courses of action to be taken in emergency to deal with production, refining, processing, transmission, storage, distribution of petroleum and its products; natural and manufactured gas; and petrochemicals produced by the industry, excluding synthetic rubber, carbon black, and ammonia.

Readiness measures taken to implement emergency planning included cooperation with State and local officials and representatives of the oil and gas industry with respect to their arrangements to meet postattack emergency situations for survival, detection and measurement of radioactivity caused by atomic explosions, continuity of company operations, facilities security, appraisal of damage to facilities, and rehabilitation.

Preplanning necessary were damage assessment studies carried on by OOG for its use and that of OCDM and its National Resources Evaluation Center, plotting on maps the precise locations of over 3,000 petroleum storage facilities of significant capacity, updating data on U.S. refineries, natural gasoline plants, oil fields, military storage, and tetraethyl lead plants, and consideration of needs for communications facilities.

## *Government-Industry Cooperation*

The National Petroleum Council provided the Department with valuable assistance and reports during 1961. The NPC Report on Maintenance and Chemical Requirements for U.S. Petroleum Refineries and Natural Gasoline Plants, dated February 7, 1961, contains information not previously available that will permit greatly improved estimates on availability of petroleum products in a postattack or disaster period when transportation is seriously disrupted.

The results of an extensive study undertaken late in 1959 were presented in a report, dated May 15, 1961, entitled "Proved Discoveries and Productive Capacity of Crude Oil, Natural Gas and Natural Gas Liquids in the United States." This was the Council's first study of proved reserves of crude oil; the last study on the subject having been made by the PAW in 1944, but the fifth NPC report on crude oil productive capacity.

Liaison with the oil producing States has been maintained by the Director of OOG at the meetings of the Interstate Oil Compact Commission which he attended regularly and by direct contact of the Office's executive staff with State regulatory bodies. The Director and technical staff members served on important interagency committees concerned with oil and gas matters, attended meetings of industry groups and trade associations to effect an understanding of Government-industry problems resulting from changing economic conditions and concepts in defense planning.

OOG reviewed a number of congressional bills and furnished guidance for the Department's use in reporting to Congress on proposed legislation. Numerous individual requests for information from the public, the Congress, and other agencies, of both U.S. and foreign governments, have been answered daily by the Office of Oil and Gas.

# *Office of Minerals Exploration*

**George Fumich, Jr.,** ***Director***

THE OFFICE OF MINERALS EXPLORATION experienced a decided increase in public interest in its program toward the end of fiscal 1961, generated by Secretary Udall's proposal to add six mineral commodities to the list of those eligible for exploration assistance and to increase Government participation from 50 to 75 percent for 18 others.

The proposal appeared in the Federal Register (26 FR 2799) on April 4, 1961, and within the 30 day period provided for comment, 60 statements were received from firms and individuals, of which all but three favored the proposed changes. Public interest was indicated further by the number of requests for information about the program received during the last quarter which totalled 1,156, a marked increase over the 956 inquiries received during the three quarters preceding the announcement.

However, the Appropriation Committees of the Congress expressed opposition to the proposed increase in Government participation and consequently, that provision has been omitted from the amendment to the regulations. Gold, silver, iron ore, sulphur, bismuth, and tellurium were added to the list of eligible commodities shortly after the end of fiscal 1961. All commodities listed will be eligible for 50 percent Government participation.

## *Program Functions*

The Office of Minerals Exploration was established on September 11, 1958, under Public Law 85–701, to provide governmental financial assistance in exploration for domestic mineral reserves, excluding organic fuels.

OME also administers contracts in force and certified projects remaining from the exploration program under the Defense Production Act of 1950, as amended, conducted from mid-1950 to June 30, 958, by the Department's former Defense Minerals Exploration Administration.

Under the OME program, the Department of the Interior contracts with qualified applicants to pay one-half of the cost of approved work in exploration for the mineral commodities listed in the OME regulations. Funds contributed by the Government are repaid by a royalty of 5 percent on any production during the progress of the exploration work.

If the Secretary of the Interior certifies that production may be possible as a result of the exploration, the royalty obligation continues until the Government's contribution is repaid with interest, or for he 10-year period usually specified in the contract. The royalty payment applies to both principal and interest, but it never exceeds 5 percent. The contractor is not obligated to produce, nor is the Government obligated to purchase any production. If nothing is produced, there is no obligation to repay.

During fiscal 1961, 44 applications were received requesting financial assistance in exploration estimated to cost $2,220,000. One application previously received was reconsidered. This brings the total for the OME program to 139 applications for exploration exceeding 39,722,000 in estimated costs and seeking deposits of 21 mineral commodities in 24 states. Actions taken on these applications are shown in the following tabulations:

*Disposition of OME applications*

| Action | Number | |
|---|---|---|
| | Fiscal year 1961 | Total |
| Received | 44 | 139 |
| Denied | 14 | 58 |
| Withdrawn | 11 | 26 |
| Contracts executed | 12 | 31 |
| Pending on June 30, 1961 | ---------- | 25 |

The 12 contracts executed during the fiscal year 1961 brought the total of executed contracts to 31. Royalties on production during the course of the exploration have been received under six contracts in the amount of $4,450. Contract actions are shown in the following table:

*Summary of OME contract data*

| Contracts | Fiscal 1961 | | | Program through June 30, 1961 | | | |
|---|---|---|---|---|---|---|---|
| | Number | Total value | Government participation | Number | Total estimated cost | Government participation | Government participation spent |
| Contract amounts as amended | 12 | $554, 176 | $277, 088 | 31 | $1, 350, 436 | $675, 218 | $232, 99 |
| Amendments which changed contract amounts | 1 | −350 | −175 | 3 | −680 | −340 | |
| Certified as possible production | | | | | | | |
| Terminated without certification | 7 | 198, 590 | 99, 295 | 12 | 302, 090 | 151, 045 | 48, 33 |
| Cancelled without Government expenditure | 1 | 34, 340 | 17, 170 | 3 | 88, 830 | 44, 415 | |
| In force as of June 30, 1961 not certified | | | | 16 | 959, 516 | 479, 758 | 184, 65 |

## DMEA Operations

The recoverable mineral commodities found on the 396 certified DMEA projects are estimated to have a value of approximately one billion dollars at current market prices.

Royalties collected incident to the sale of minerals found under DMEA contracts amounted to $382,953 in this year. Total royalties received since the start of the program amount to $3,954,099. Sixty projects have repaid in full the $1,804,812 contributed by the Government. Actions on DMEA contracts are shown below.

*Summary of DMEA contract data*

| Contracts | Fiscal 1961 | | | Program through June 30, 1961 | | | |
|---|---|---|---|---|---|---|---|
| | Number | Total value | Government participation | Number | Total estimated cost | Government participation | Government participation spent |
| Contract amounts as amended | | | | 1, 159 | $56, 770, 493 | $34, 805, 244 | $23, 337, 410 |
| Amendments which changed contract amounts | | | | 220 | 6, 223, 003 | 3, 748, 831 | |
| Certified as discoveries | 5 | $1, 650, 267 | $848, 807 | 396 | 29, 554, 346 | 18, 238, 005 | 14, 773, 755 |
| Terminated without certification | 5 | 965, 295 | 482, 648 | 677 | 24, 177, 658 | 14, 802, 234 | 8, 399, 961 |
| Cancelled without Government expenditure | | | | 83 | 2, 245, 459 | 1, 368, 490 | |
| In force as of June 30, 1961 | | | | 3 | 793, 030 | 396, 515 | 163, 694 |

# *Office of Minerals Mobilization*

## William E. S. Flory, *Acting Director*

The Office of Minerals Mobilization carries out the responsibilities of the Secretary of the Interior for national defense preparedness in metals, minerals and solid fuels, and for production and distribution of metals, minerals and solid fuels, consistent with the National Plan for Civil Defense and Defense Mobilization and delegations by the Office of Civil and Defense Mobilization, as well as nonmobilization assignments of problems in metals, minerals and solid fuels.

During the fiscal year 1961, the Office continued to evaluate the extent to which metals, minerals and solid fuels available from all sources would be able to meet estimated national defense emergency requirements. It continued to cooperate with the Department's Bureau of Mines on studies of markets, price and domestic production component of the mobilization base.

Mobilization base-type studies were made on antimony and oxygen-free copper. Other complex evaluations undertaken in fiscal year 1961 included problems encountered in the Arizona domestic asbestos purchase program, exploration and mining of beryllium bearing ores, upgrading of stockpile electrolytic copper and oxygen-free copper, the synthetic mica research program, supply-demand analysis on tellurium and a review of the world copper industry. Two revised evaluations were made of high temperature and special property materials.

An examination of the Mexican fluorspar reserves was made for OMM by the Department's Geological Survey in cooperation with the Government of Mexico.

## *Defense Preparedness*

Members of the staff participated in phase I of Operation Aler 1961 at OCDM's classified location. Duplicate files and document are maintained by OMM at the relocation site for use in alert exercises and in the event of a national emergency.

A member of OMM staff is an instructor of radiological monitoring and participated in courses for instructors held in Boston, Atlant and Syracuse during fiscal year 1961.

## *Defense Stockpiling*

The Office advised OCDM in formulating and carrying out plan for stockpiling of strategic and critical materials and disposals from Government inventories of metals and minerals in excess of defense requirements.

In fiscal year 1961, OMM also assisted OCDM in the Nationa Resources Evaluation program by assembling, coding and keeping current input data on metals, minerals and solid fuels for use in computing machines for assessing bomb damage of industrial facilities in the event of an enemy attack.

## *Executive Reserve*

A joint meeting of members of the solid fuels and minerals units of the Department of the Interior Executive Reserve was held in Washington, D.C., for the purpose of indoctrination and training. The Office continued to recruit industry officials to serve in the OMM unit of the National Executive Reserve, and during the fiscal year additional reservists were designated to serve in this capacity, making a total of 67 reservists enrolled by the close of the fiscal year.

The OMM represented the Department of the Interior on the Interdepartmental Materials Advisory Committee on stockpiling matters, on the Supplemental Stockpile Advisory Committee for barter on acquisitions of materials by barter, on the Operating Committee of the Advisory Committee on Export Policy on export control matters, and on the Interdepartmental Committee on the Soft Coal Industry.

# Office of Geography

**Meredith F. Burrill**, *Director*

The Office of Geography provides research and other staff services for the interdepartmental Board on Geographic Names and the Secretary of the Interior in the field of foreign nomenclature.

During the year the office processed for standardization by the Board and prepared for publication about 250,000 names in Albania, Greece, Spain, Portugal, the Cape Verde Islands, Hungary, Denmark, the Faeroe Islands, the Arabian Peninsula, and Yugoslavia. Thirty thousand names were edited on maps or otherwise supplied to users as the result of inquiries.

Procedures for name standardization were formulated for 36 foreign areas. Special attention was given to studies of terms used to identify and classify named entities, to the nonroman alphabet languages of southeast Asia, and to the names of the newly independent African countries and their internal administrative divisions. International standardization of names continued to be a matter of primary interest.

# Board on Geographic Names

**William G. Watt**, *Chairman*
**Meredith F. Burrill**, *Executive Secretary*

The interdepartmental Board on Geographic Names, established in 1947 to provide a central authority for standardizing geographic names for use by the Federal Government, is composed of representatives of the Departments of the Interior, State, Army, Navy, Post

Office, Agriculture, Commerce, and Air Force; the Government Printing Office, the Library of Congress, and the Central Intelligence Agency.

The Secretary of the Interior acts conjointly with the Board in achieving name standardization and provides staff facilities and maintains the records of the Board and its Committees. Foreign names staff functions are performed by the Office of Geography, domestic names functions by the Geological Survey.

The Board conferred with representatives of the Permanent Committee on Geographical Names for British Official Use and further clarified and extended policies leading toward the standardization of geographic names on an international basis.

Staff work on domestic names was maintained on a current basis and the previous backlog liquidated. Three lists containing 1,418 domestic decisions were published during the year and 447 additional domestic names were approved for a fourth list.

The Board's Advisory Committees on Antarctic Names and on Arabic and Persian continued active in their fields of special interest. A new project extending the Board's work in Antarctica was initiated with National Science Foundation support.

# *Office of Coal Research*

## George A. Lamb, *Director*

The Office of Coal Research, still less than a year old, has made notable progress in establishing its program to expand the use of coal. The law creating the OCR—Public Law 599 of the 86th Congress—was passed in 1960, after 4 years of hearings and legislative study.

In fiscal 1961, an organization was created and staffed, basic policies and guidelines were established, and activities are underway that are expected to culminate within a few months in a going research and development program.

### *Industry-Government Cooperation*

A General Technical Advisory Committee, composed of 19 representatives from all segments of the coal industry, has been appointed by the Secretary of the Interior to advise him and the Office of Coal Research on the development and direction of the program. This representation includes coal producers, consumers of coal (chemical companies, public utilities, railroads, and retailers), educational institutions, labor, and manufacturers of coal equipment. The Committee held its first meeting on June 6, 1961.

Scientists, engineers, and economists of outstanding capability in the various areas of activity encompassed by the program are being assembled into an advisory panel to assist in judging the technical merits of research proposals and to assist in assessment and solution of knotty problems. The scientists and engineers on this panel largely were selected with the advice of the National Academy of Sciences—National Research Council.

### *Function of OCR*

The function of the Office of Coal Research is to contract for research that will stimulate the production and wise consumption of coal, and otherwise to sponsor and promote research with and among recognized interested groups, including commercial research laboratories, colleges and universities, coal companies and trade associations, State and Federal agencies, and qualified individuals. Research is defined by the statute itself as meaning scientific, technologic, and economic research, and the practical application of that research as well.

The mission of the Office of Coal Research is to exploit the full potentiality and versatility of this abundant resource to the maximum welfare of our Nation. Toward this end, the Office of Coal Research will devote its efforts to enlarge and increase the use of coal not only within its present known areas of use, but also by seeking new uses to which coal may be applied economically and practically.

The Office of Coal Research was established as a separate agency of the Department of the Interior in order to make it possible to hit hard at a program designed for expeditious commercial results without conflicting with the coal research program of the Bureau of Mines, while at the same time providing for the coordination of the two in order to get a unified national coal-research program.

An appropriation of $1,000,000 to the Department of the Interior for fiscal 1961 for the Office of Coal Research was provided by Congress.

# Office of the Assistant Secretary
# *Public Land Management*

**John A. Carver, Jr.,** ***Assistant Secretary***

The Department of the Interior is sometimes characterized as a loose confederation of bureaus. The five bureaus which fall within the supervisory orbit of the Assistant Secretary for Public Land Management represent an extreme range of diversity of mission, from the broadest spectrum of government itself in the Trust Territory of the Pacific Islands and other Territories, to the essentially proprietary nature of operating a mainline railroad in Alaska.

Even among the land managing agencies—National Park Service, Bureau of Land Management and the Bureau of Indian Affairs—there are fundamental differences in outlook. The touchstone of management responsibility for Indian lands is trusteeship; for park lands, preservation; for public domain lands, beneficial use on a sustained yield basis.

It has been the aim of the Assistant Secretary, Public Land Management, to weld these bureaus together in spirit toward a Departmental, rather than a bureau, approach to their respective operating responibilities. Bureaus which can draw upon each other for specialized knowledge and experience can better serve the public, at less cost to the taxpayer.

The Department of the Interior's enormously broad experience in he management of natural and human resources ought to be available across all bureau lines.

# *Bureau of Indian Affairs*

## Philleo Nash, *Commissioner*

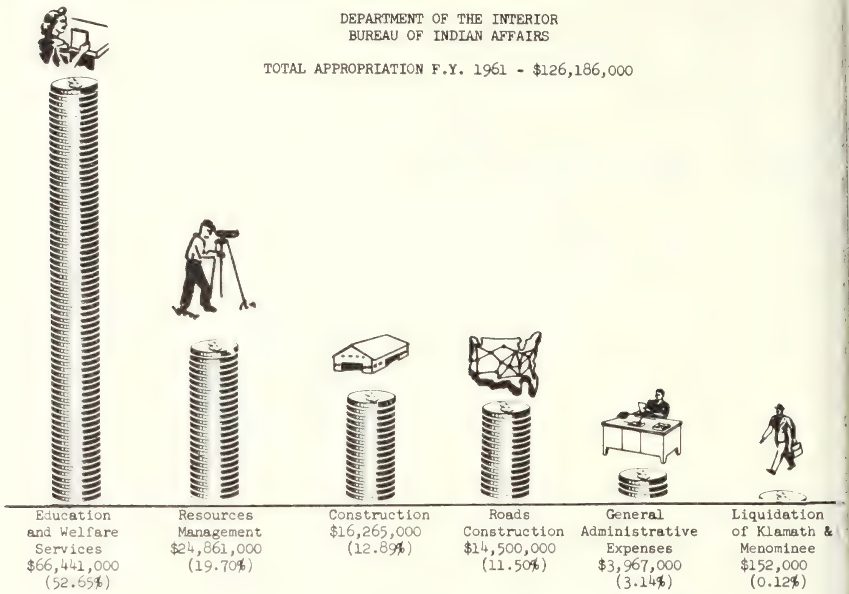
A "New Trail" for Indians leading to equal citizenship rights and benefits, maximum self-sufficiency and full participation in American ife became the keynote for administration of the program of the Bureau of Indian Affairs of the Department of the Interior shortly after the close of the 1961 fiscal year.

This keynote was provided in a 77-page report submitted to Secretary Udall by a special Task Force on Indian Affairs which he appointed in February 1961. The report was presented shortly after the end of the fiscal year, and its major recommendations were at that time accepted and endorsed by the Secretary.

Probably the most important single recommendation was for a shift in program emphasis away from termination of Federal trust relationships toward greater development of the human and natural resources on Indian reservations.

This was coupled, however, with a recommendation that eligibility for special Federal service be withdrawn from "Indians with substantial incomes and superior educational experience, who are as competent as most non-Indians to look after their own affairs." Emphasis was also given to the beneficial nature of Federal programs—such as those under the Social Security Act and the Area Redevelopment Act—which treat Indians and non-Indians alike.

In addition, the report recommended (1) more vigorous efforts to attract industries to reservation areas, (2) an expanded program of vocational training and placement; (3) creation of a special Reservation Development Loan Fund and enlargement of the present Revolving Loan Fund, (4) establishment of a statutory Advisory Board on Indian Affairs, (5) negotiation with States and counties, and resort



to the courts where necessary, to make certain that off-reservatio Indians are accorded the same rights and privileges as other citizen of their areas, (6) collaboration with States and tribes to bring triba law and order codes into conformity with those of the States and cour ties where reservations are located, (7) acceleration in the adjudicatio of cases pending before the Indian Claims Commission, and (8) mor active and widespread efforts to inform the public about the status o the Indian people and the nature of their problems.

## *Heirship Lands*

Calling attention to the complex problem of “heirship” land allotments owned by numerous Indians who either cannot be located o cannot agree on use of the property, the report advocated transferrin these fractionated holdings to the tribe and permitting the latter t compensate the owners through some system of deferred payment.

As a step toward transferring the responsibility for Indian education to local school districts, the Task Force urged renovation o present Federal school buildings, construction of new plants, and roa improvements so that more Indian children can be bussed to classes It also called for greater efforts to involve Indian parents in schoo planning and parent-teacher activities. As a measure to relieve overcrowding of present facilities, the report suggested that consideratio be given to keeping them in use throughout the entire year. Durin the summer months, it added, some of these facilities could also be use programs to help Indian youngsters make constructive use of eir leisure time.

### sk Force Make-Up

The Task Force was headed by W. W. Keeler, principal chief of Oklahoma Cherokees and oil company executive. The other mbers were Philleo Nash, longtime student of Indian affairs and rmer lieutenant governor of Wisconsin; William Zimmerman, Jr., sistant commissioner of the Bureau from 1933 to 1950; and James ficer, a University of Arizona anthropologist. Acting Commis- oner John O. Crow consulted with the Task Force and accompanied on field trips.

The Task Force study extended over a period of about 5 months d included consultations both in Washington and the West with umerous tribal leaders and non-Indian experts in the field.

## Tribal Programs

In fiscal 1961 the Menominees of Wisconsin with their 3,270 enrolled embers and forest holdings valued at about $35 million reached e stage of full independence from Federal trusteeship in the man- gement of their property. Federal trust relations were also ended nder tribally developed plans on seven small rancherias of alifornia.

Progress toward the same goal was made on the Klamath Reserva- on in Oregon, the Uintah-Ouray Reservation in Utah, the Catawba eservation in South Carolina and 31 additional California ranch- ias. The first steps leading toward such a program were taken on e Colville Reservation in Washington.

Development of programs for the effective use of tribal funds was oteworthy on the Pine Ridge and Cheyenne River Reservations f South Dakota; on the Coeur d'Alene Reservation of Idaho; and mong the Quapaws of northeastern Oklahoma.

### enominee Tribe of Wisconsin

At midnight, April 30, 1961, Federal supervision of the affairs of he Menominee Tribe of Wisconsin ended by proclamation by the ecretary in accordance with the Act of June 17, 1954 (68 Stat. 250), s amended.

The transfer of control of the lands, forest, and other properties f the 3,270 Menominee Indians to a State-chartered corporation, the creation of Menominee County by the Wisconsin legislature to provide for the political organization and social needs of the people, an the establishment of a trust with a Milwaukee bank to hold and inves funds belonging to Menominee minors and other persons in need o assistance were the major results of nearly 7 years of argument, negotiation, and finally cooperative action involving the Menomine people, the officials of Shawano County, the State government a Madison, and the Congress and the Bureau of Indian Affairs. Although Federal responsibility for these Indians has now been officially terminated, the friendly interest of the Bureau in their succes in a new era of self-government and self-management as citizen of the State of Wisconsin will continue indefinitely.

In September 1960 Congress amended the original 1954 termination act for the fourth time by granting the tribe an extension o the trust period from December 30, 1960 to April 30, 1961, but directing the Secretary to begin negotiations for private trustees immediately in order to be prepared to act in the event the tribe had no organized under its own termination plan by March 1, 1961.

### *Tribe Takes Action*

Happily for all concerned, this proved unnecessary. Beginning i November 1960 the tribe began to act expeditiously to implement it own plan which the Secretary had approved in principle in 1959 In December the tribe's general council elected seven voting trustee (four members of the tribe, three nonmembers) for the propose Menominee Enterprises, Inc., which was to own and operate its timbe industry and other properties.

On January 9, 1961 the Secretary formally approved the fina draft of the tribe's termination plan. On January 13 the seven votin trustees met and designated the nine directors (four tribal members five nonmembers) who were to control the policies and operation of the new corporation.

On February 24, the tribe informed the Secretary that the Menominee Enterprises, Inc., had been duly established and was a goin concern. On January 23 articles of incorporation had been filed wit the Secretary of State of Wisconsin; on February 7 the Secretar of State had issued a certificate of incorporation; and on Februar 10 the Board of Directors had met at Keshena for the election o officers, and had, among other business, accepted the initial stock subscription of $327,000 from tribal funds in the U.S. Treasury to issu 100 shares of $1 par value stock in the name of each Menomine member.

On March 7, 1961 the tribe (in accord with a resolution of the general council in January) chose by secret ballot proposed members of the Menominee County and Town Board for appointment by the Governor when, by State law, the new county and town should come nto existence.

### *Final Proclamation*

All provisions of the 1954 act having been complied with, Secretary Stewart L. Udall on April 29, 1961 proclaimed in the Federal Register the "termination of Federal supervision over the property of the Menominee Tribe of Wisconsin and of the individual members thereof" effective midnight April 30.

He also had published in the Federal Register the text of the "Plan for the Future Control of Menominee Indian Tribal Property and Future Service Function." This was important not only as a matter of public information, but was vital in the creation of Menominee County. Chapter 259 of Wisconsin's Laws of 1959 had provided that the State's 72d county should come into existence on he date of publication of the termination plan in the Federal Register, as required by the Act of June 17, 1954. On May 5, 1961, at Keshena, Governor Gaylord A. Nelson swore in and installed the first board members and officers of Menominee County and Menominee Town.

Meanwhile, early in 1961, bills had been introduced in Congress to postpone again the date of termination and to provide various types of Federal assistance to the Menominees following termination. As April 30 passed before action by Congress, there was no delay in the termination date. H.R. 4130, providing for a loan to Menominee Enterprises, Inc., and Federal aid to the State in providing essential education, health and welfare services to the Menominee during the period of transition was still pending in conference between the Senate and House as the fiscal year ended.

### *Klamath Tribe of Oregon*

As one of the final steps in the administration of the Act of August 13, 1954, as amended, sales of Klamath tribal lands designated for the withdrawing members were completed within this period. A proclamation issued by the Secretary of Agriculture taking title to the 10 large, unsold sustained-yield units for a National Forest was published in the Federal Register on April 15, 1961. On April 18, 1961, the Portland Area Director made a pro rata distribution of $43,124.71 to each of the 1,660 individuals withdrawing from the Tribe with offsets for land purchases, loans and other indebtedness. Sixty-nine additional bank trusts were established during March 1961,

making a total of 191 trusts for adults and 743 trusts for mino
among the withdrawing members.

Claims attorneys for the Klamath Tribe in April 1961 filed Petiti
No. 125–61 before the Court of Claims, contending that the secon
1958 appraisal of the Klamath tribal forest lands of $90,791,123 di
not adequately consider values for water rights, waterpower site
recreation potential and similar items.

The United States National Bank of Portland has assumed ma
agement of the lands of the 473 remaining members on the 1957 rol
All termination action is to be completed by August 13, 1961.

## *Ute Tribe of Utah*

On September 8, 1960, funds totaling $7,700,000 were appropriate
for the compromise settlement of the Uintah Ute Indians' claim
Dockets No. 44 and 45, before the Indian Claims Commission. O
December 19, 1960, a cash distribution of $3,900 was approved f
each of the 490 members of the Affiliated Ute Citizens (mixed-bloods
Concurrently, approval was given for six per capita payments tota
ing $975 to each member of the Ute Indian Tribe (full-bloods), t
balance of their portion being retained for future tribal programmin

Under authority of the Act of August 27, 1954 (68 Stat. 868),
amended, the Affiliated Ute Citizens in 1958 organized the Antelo
Sheep Range Corporation and the Rock Creek Cattle Corporati
for the purpose of managing and administering the grazing lan
acquired under that act. It was agreed in 1960 that the shares
stock of the two range corporations would be purchased by the U
Indian Tribe (full-bloods). Purchase of these shares was beg
soon after January 1, 1961. As of June 30, 1961 the Ute India
Tribe had acquired approximately 400 shares of the 490 issued
each corporation.

To permit more efficient budgeting and control procedure, the lon
range (10-year) program was converted into a continuous progra
budgeted on a 5-year basis.

## *California Rancherias*

Administration of the Act of August 18, 1958 (72 Stat. 619
providing for the termination of Federal trusteeship of 41 of t
115 rancherias and reservations in California, was completed in r
gard to 7 rancherias. On April 11, 1961 there was published in t
Federal Register a notice of termination for the Strawberry Valle
Cache Creek, Buena Vista, Paskenta, Ruffeys, Mark West, and Tab
Bluff rancherias. According to this permissive legislation, the pe
ple of a rancheria must agree on and submit a plan for the distrib

tion of their land and other group assets before termination can take effect.

By the end of the fiscal year, 31 rancherias, in addition to the 7 mentioned above, had submitted distribution plans. As the Bureau completes the steps required in these plans, the Federal trusteeship of the rancherias will be ended. If plans are eventually approved and carried out for all 41 rancherias included in the law, the action would affect the status of approximately 1,295 Indians living on a total of 7,669 acres of trust land.

### *Catawba Indians of South Carolina*

On July 2, 1960 the Federal Register carried a notice that the Catawba Indian Tribe of South Carolina had accepted the terms of the Act of September 21, 1959 (73 Stat. 592) providing for distribution of the tribe's assets among the membership and termination of Federal trusteeship. Administration of the act proceeded during the year, with members of the tribe selecting tracts of land for individual ownership or electing to accept cash from the sale of surplus land.

When administration is completed by terms of the 1959 act on or before July 2, 1962, the status of approximately 731 Indians and ,389 acres of trust land will have been affected.

### *Colville Indians of Washington*

The Business Council of the Confederated Tribes of the Colville Reservation of Washington carried forward the preparation of plans for the ultimate termination of Federal supervision over their lands and affairs as provided by the Act of July 24, 1956 (70 Stat. 626). Tentative proposals were required to be submitted to the Secretary by July 24, 1961.

Shortly after the close of the reporting year, the Business Council on July 12, 1961 submitted a two-stage termination plan: the first stage would provide by legislation an intensive survey and appraisal of the tribe's resources, together with the preparation of a final membership roll; on the basis of these findings, the second stage would consist of submitting a legislative program for final termination of Federal supervision.

### *Standing Rock Rehabilitation Program*

The Standing Rock Sioux Tribe of North and South Dakota continued administration of its $9 million rehabilitation program made possible by land-taking settlements for Missouri River developmen under the Act of September 2, 1958 (72 Stat. 1762). In July 1960 th tribe initiated its industrial development program with $770,000 se aside for this purpose. It invested $110,000 of this money in a ne building at McLaughlin, S.D., which will be operated as a quiltin plant by the Harn Corporation of Cleveland, Ohio.

In April 1961 the educational loan grant program was starte The tribe has allocated $2 million for post-high school loans an grants for academic studies or vocational training.

In May 1961 a community development program, involving a tota outlay of $770,000 was approved. The eight districts of the reservation will receive varying amounts. The money may be used for community hall, recreation center, water and sanitary facilities, c for any other purpose which can be justified as benefiting the community as a whole.

As of June 30, 1961 the family plan phase of the rehabilitatio program (which was described in some detail in last year's annua report) showed a total of 255 new houses completed on the reservation at a cost of $514,527; 78 approval contracts not completed fo an estimated $128,535; 79 old houses acquired for $131,586; 48 trailer at $80,108; and 10 additions to existing houses at a cost of $10,890 or a total outlay of $865,646.

## *Oglala Sioux*

On June 13, 1961 the Housing and Home Finance Administrato announced approval of a $166,000 loan for construction of a housing-for-the-elderly project on the Pine Ridge Indian Reservation. Th project was initiated by the leaders of the Oglala Sioux Tribe. Th sponsoring organization, the Pine Ridge Settlement Home, is composed of both Indian and non-Indian men.

The home will consist of a one-story building which will contai 23 living units to accommodate 38 persons, a central dining room, an a recreation room. A monthly charge of about $75 per person wil be made, including room, board, utilities, laundry, and social an recreational activities.

## *Cheyenne River Sioux*

Since the inception of its Rehabilitation Program in 1956, th Cheyenne River Sioux Tribe has taken the position that it was no subject to the taxes imposed by the Federal Unemployment Tax Ac and that it was not required to withhold Federal income tax deductions from its employees' salaries.

his matter has been the subject of extensive discussions and corpondence between the tribe and the Internal Revenue Service. ring June, 1961, the Internal Revenue Service attached the tribe's ds on deposit in a bank at Mobridge, S. Dak., and subsequently ed $206,000 of such funds.

### *eur d'Alene Judgment Fund Distribution*

he Act of July 17, 1959 (73 Stat. 221), authorized the use of the gment funds awarded to the Coeur d'Alene Tribe of Idaho by the lian Claims Commission for any purpose authorized by the tribal erning body and approved by the Secretary of the Interior. The al officials requested an initial per capita payment of $1,000 be de to each Indian whose name appears on the Coeur d'Alene census l of July 1, 1940, and who was living on July 17, 1959, except those ignated as "NE," meaning not enrolled.

n October 14, 1960, the Commissioner authorized the Portland ea Director to make a $1,000 per capita payment from the judgment ds to each person whose name appears on the payment roll, conning the names of 490 individuals, prepared by the Coeur d'Alene al officials for that purpose and approved by the Commissioner October 14, 1960.

he Area Director was also authorized to pay $1,000 to each person ose name appears on a supplemental payment roll to be prepared the tribal officials containing the names of individuals adopted o the membership of the tribe and children of one-fourth or more lian blood born after July 1, 1940, to members of the tribe. A plemental payment roll containing the names of 302 individuals determined to be eligible to share in the judgment funds was proved by the Acting Commissioner on April 28, 1961.

### *apaw Judgment Fund Distribution*

Pursuant to the Act of July 17, 1959 (73 Stat. 221), a roll was pared for use in distributing the judgment of $927,668.04 awarded Quapaw Indians by the Indian Claims Commission. Of 1,379 plicants for enrollment 1,144 persons were determined to be eligible share in the judgment funds.

n May 4, 1961, the Area Director of the Muskogee Area Office was thorized to distribute per capita to those persons whose names pear on the roll the balance of the judgment funds remaining after duction of administrative costs incurred in the preparation of the yment roll. The amount available for distribution on May 1, 1961, luding interest accruals through April 30, 1961, was $1,029,600. e share paid each of the 1,144 persons on the roll was $900.

## *Area Redevelopment Activities*

Under the Area Redevelopment Act of May 1, 1961 (75 Stat. 4
the Secretary of Commerce has delegated to the Bureau of Ind
Affairs (through the Secretary of the Interior) broad responsibilit
in carrying out those provisions of the law pertaining to Indian res
vations and Indian tribes.

Following this delegation, the Bureau took immediate action on
selection of criteria and formulation of standards under which Ind
reservations might be designated as "Reservation Redevelopm
Areas" eligible for assistance under the Act. As of August 1, 1
48 reservation areas (including 4 areas in Alaska) have been
designated. It is anticipated that additional reservations will
designated from time to time.

Major emphasis is currently being placed on assisting Ind
Tribes, as well as non-Indian groups, in the designated "Reservat
Redevelopment Areas" in the formulation of overall economic devel
ment programs required under the Law. These programs are
point up the present economic conditions and problems in the are
describe the potentialities for upgrading the local economies a
providing needed job opportunities, and submit specific progr
proposals to achieve these potentials.

Additional Bureau responsibilities under the Act will involve
sistance to the tribes in outlining and carrying out specific proje
under the approved overall economic development programs in des
nated reservation redevelopment areas, and the development o
program to provide occupational training of unemployed and und
employed Indians in these areas to enhance their opportunity
employment.

## *Education*

Enrollment of Indian children of school age increased 3 percent
fiscal 1961 as compared to the preceding year. Of the 112,746 child
enrolled, 57.6 percent attended public schools, 34.5 percent were
Federal schools, and 7.9 percent in mission and other private scho
Public school enrollment increased by approximately 1,450 stude

During the year 1961, the Bureau has dropped from its census
Indian school children those residing in California, Idaho, Michig
Minnesota, Nebraska, Oregon (except the Warm Springs Agenc
Washington, Wisconsin and Texas. These are the States which h
accepted responsibility for the education of their Indian child
The comparisons given above are based on figures adjusted to ref
this change.

***e of the 20 school construction projects completed by the Indian Bureau in al 1961 was the 22-classroom Oglala Elementary School on the Pine Ridge servation in South Dakota.***

The Bureau of Indian Affairs in fiscal 1961 operated 270 schools th an enrollment of 41,729 including those under 6 and over 18 years age. In addition, dormitory facilities were provided at 19 locations r 3,953 students who attended public schools. Dormitory operations this type are used to meet unusual emergency needs and do not flect a permanent pattern for educating Indians.

### *uality in Education*

As a part of the improved reading program and the advancement scholarship generally, in Bureau schools, emphasis is being given to e upgrading of libraries in all areas and to developing students' abits and skills in library use. The Bureau-wide film depository has so continued to improve significantly its collection and its services schools.

Improved curriculum guides and additional teaching materials have een put into use in many schools with good results.

Teachers and supervisory personnel have worked continuously on iteria for developing superior teaching and on techniques for achiev ng it.

*Girl Scouts, hobby clubs, and other leisure time activities provide opportun for making friends, pursuing special interests, and developing traits of g citizenship.*

Manuals for teaching efficient housekeeping skills have been veloped and are being used in all schools.

One school is making use of the teaching team techniques in a pil project to determine its effectiveness in Indian schools and results i dicate that much wider use can be made.

Through accelerated efforts and meticulous attention to the u of the English language, there was a notable increase in langua skill in several areas. Several schools are experimenting with n combinations of techniques in the language arts program and t results are being studied carefully for possible wider use.

## *Guidance*

Leadership in the coordination of the guidance services in boardi schools has been strengthened through in-service training sessions f all levels of positions. Use of educational leave, extension classes cooperation with State colleges, and Area conferences are improvi understanding and professional services.

*oung Navajo students are helping to assemble a classroom unit on government.*

More individual counselling is being accomplished and close per-
nal attention to the emotional problems of boarding school students
s received special study in connection with educational and voca-
onal guidance.

### *ummer Programs*

During fiscal 1961, approximately 2,200 Indian youth participated
summer programs sponsored by the Bureau. These programs,
esigned to enrich the experiences of Indian youngsters and con-
ribute to their overall development, are held on 27 reservations and
t 10 nonreservation boarding schools. Work, academic, recreational,
couting, camping, and arts and crafts programs were among the
umerous activities engaged in by these students.

School administrators report that summer programs have played
n important role in changing attitudes about school and inducing
oungsters to return and remain in school. Several indicated that
he 1960–61 school year was their best year in terms of pupil adjust-
ment. Other officials report that antisocial behavior among juveniles
as been substantially reduced in areas conducting summer programs.

*To promote physical fitness, all students are encouraged to participate in spor and other physical activities. The tennis players above are students at the Inte mountain School, Brigham City, Utah.*

## *Non-Federal Schools*

Concurrent with the emphasis on improving the quality of the in struction and guidance programs within Bureau-operated school staff personnel have initiated studies designed to learn the problem and possible approaches for assisting Indian children who are no adjusting or have dropped out of public schools.

The findings of the study project in one area are being documente and shared with all other Areas, and with public school offiicials t assist them in developing a better understanding of the backgroun social and educational needs of Indian children.

## *Adult Education*

The purpose of the adult education program is to assist the India people to raise their general education level and thus reduce the edu cational disparity which exists between Indian people and the genera population. It provides an opportunity for them to acquire th necessary skills and understanding to live better and participate mor effectively in today's world.

Adult education teaching units have been established upon the request and with the concurrence of the tribal governing bodies at 28 agencies and locations throughout the United States. These teaching units are now serving approximately 107 Indian communities and offer a wide variety of instruction. The programs range from reading and writing courses to instructing individuals and groups of Indian people in specific subjects and civic skills. Personnel of the adult education program are in the process of developing a series of in-service training guides which will be used to strengthen the instructional and other phases of the program. Throughout this past year there have been approximately 5,800 adult Indian participants or learners in this program. Of this number several have completed the required studies for high school graduation, while others have been engaged in informal learning activities.

More than 600 Indian students attended college in 1960–61 with the help of Federal loans and grants made available through the Bureau. Sixty-six of these students graduated from 4-year colleges at the end of the school year. The Bureau assisted many other Indian students in securing non-Federal scholarship aid.

## *Welfare*

During the fiscal year 1961 the assistance trends of previous years continued. There was a substantial increase in the requirements for assistance to needy families on reservations. Funds originally appropriated were insufficient, and it was necessary to secure a supplemental appropriation of $1 million to meet the increased need. There was also a marked increase in provision of social services to families and individuals not receiving financial assistance, and an increased use of Bureau social workers by tribal courts. Child welfare services to dependent and neglected children were a major function of the welfare program, and counseling services regarding use of restricted individual funds continued to be an important responsibility.

### *General Assistance*

The caseload and expenditures for general assistance have risen steadily during the past few years due largely to decreasing opportunities for unskilled labor because of mechanization of agricultural operations. This trend is continuing.

Expenditures for general assistance in 1961 were over 12 percent higher than in 1960, and the average monthly caseload of persons was over 8 percent higher. Assistance needs increased in almost all

Areas, with the greatest increases occurring in the Phoenix, Billings and Juneau Areas.

The number of needy Indians receiving general assistance varied i the usual seasonal pattern from a low of 2,568 households with 6,51 persons in July to a high of 6,156 households with 21,066 persons i March. The average monthly caseload was 4,086 households wit 12,749 persons. The average monthly assistance grant was $75.0 per household. This average grant includes many households wit some income but requiring supplemental assistance.

## *Social Services*

Social services are provided when necessary to persons receiving assistance. In addition to this group, approximately 10,000 cases, whic did not receive financial assistance, received counseling or guidance t some degree. This included families, unattached individuals, and dependent and neglected children.

Social workers have noted an increase in voluntary requests for suc services and in requests for counseling by tribal courts, particularl with respect to children.

## *Child Welfare*

The problems of dependent and neglected children resulting fron unstable or broken homes remain a matter of serious concern on man reservations. Bureau funds provided care for over 2,300 childre during the year. The number of children called to the attention o social workers increases steadily. Foster home placement and placement of physically and mentally handicapped in appropriate institutions have increased; the resources and staff time available for children, however, are still insufficient to meet the need.

Although the child welfare workload has increased substantially in recent years, this is apparently due primarily to the fact that, becaus of improved coverage and growing awareness by Indians of their social problems and the availability of social services, more attention has been focused on conditions which have existed for some time.

The Indian adoption project being conducted under a contract with the Child Welfare League of America is progressing satisfactorily. Under this project, Bureau social workers on selected reservations can refer homeless children for adoptive placement to qualified adoptive agencies selected by the Child Welfare League of America. During the past year, 20 Indian children were placed through six agencies in adoptive homes. Three of the children were under the custody of a State Welfare Department which used the resource made available through the adoption project.

### *Jurisdiction*

As has been reported in previous years, legal jurisdictional problems continue to hinder or prevent the provision of adequate services for dependent or neglected children on reservations in several States.

Commitment of adult Indians, as well as children, to appropriate State institutions has also been hindered. Several emergency situations have been handled through improvised measures, but no real solution to this problem has been found. The only element of progress is that at both the State and Federal levels more attention has been focused on the murky legal situation which results, without intent to discriminate, in Indians on reservations not having available to them certain social resources requiring court action which are available to other citizens.

## *Law and Order*

Pursuant to the authority granted by the act of August 15, 1953 (P.L. 280, 83d Congress; 67 Stat. 588), the State of South Dakota enacted legislation, signed by the Governor on March 9, 1961, providing that the State would assume jurisdiction of criminal offenses and civil causes of action arising in the Indian country within the State at such time as the Governor is satisfied that the United States has made proper reimbursement to the State and its counties for the added costs in connection with the assumption of such jurisdiction. Such a Federal subsidy, however, is not required by the statute prior to the State assuming jurisdiction over criminal offenses and civil causes arising on highways within the Indian country in the State.

The Department of Interior has no authority to subsidize State and county law enforcement activities among Indians on reservations. Consequently, this legislation, excepting that section relating to the assumption of jurisdiction over highways, has no present applicability to Indian country within the State of South Dakota.

At the request of the Seminole Tribe, and in accordance with the act of August 15, 1953, supra, the Florida Legislature enacted House Bill No. 2241, signed by the Governor on June 14, 1961, assuming jurisdiction over criminal offenses and civil causes of actions involving Indians, or other persons, rising within Indian reservations throughout the State. The act became effective July 1, 1961.

On May 12, 1961, Sections 11.9 and 11.9CA, Title 25, Code of Federal Regulations, which prohibited the appearance of professional attorneys in proceedings before the Court of Indian Offenses, were revoked from Departmental regulations. This revocation applies t the 15 Courts of Indian Offenses, but will have no application t those courts established by tribal enactments. These latter court have regulations similar to the revoked provisions.

### *Attention to Juveniles*

Matters involving Indian juveniles came into more prominen during the fiscal year. Several additional juvenile officer positio and two probation and parole positions were established, and pr grams for the alleviation of juvenile delinquency, including guidan and counseling for both juveniles and adults coming to the attentio of the Indian courts, have been established. As directed by th Senate Appropriations Committee in its report on the Interior Appr priation Bill for 1961, the Bureau conducted a survey of juvenil delinquency on Indian reservations in the Pacific Northwest, inclu ing the States of Washington, Oregon and Idaho, to determine th magnitude of the problem and the steps that are required to resolv it.

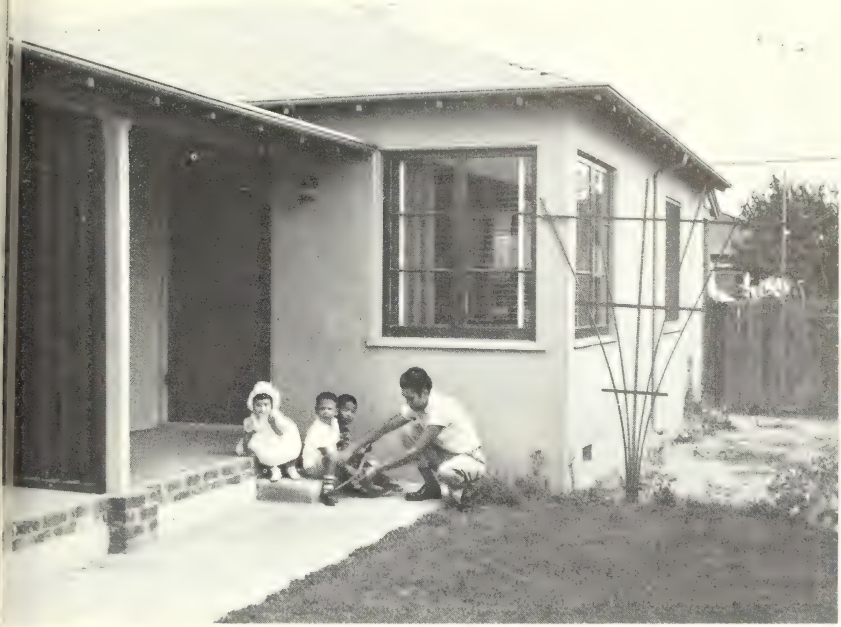
Construction of several badly needed jails on Indian reservatio was commenced during the fiscal year. These buildings will provid incarceration facilities, courtroom, and office space for the adminis tration, care and confinement of Indian prisoners.

## *Relocation and Training Services*

One of the main aims of the Bureau is to provide Indian peopl with opportunities to become self-sufficient through full-time, yea round employment. In order to accomplish this objective, eligibl Indians are assisted to relocate in off-reservation locations or to pr pare themselves through enrollment in adult vocational trainin courses which upon completion, will qualify them for suitabl employment.

Vocational training is provided at established public or privat trade schools or through on-the-job training in established indus tries or business establishments. Although most employment oppo tunities in the past have been found in large industrial areas distan from the reservations, increased emphasis is now being given to locat ing jobs as near the reservation areas as possible for those applicant who can best be served in this manner.

These services during fiscal year 1961 were somewhat curtaile by the economic recession and the increase in unemployment through out the country. However, by offering more effective staff service



*eady employment means better living standards for many Indian families who ave relocated with Indian Bureau help to urban communities.*

ncluding individualized employment placement service, this activity as able to continue operating effectively. The high percentage of nemployed people in some areas and the comparative difficulty of nding suitable employment for unskilled workers emphasized the eed for additional on-the-job and institutional training opportunities.

Despite the difficulties of finding stable employment during this eriod, most relocated Indians were able to remain in their new locaions and the majority of them who were laid off are now again vorking on suitable jobs of a permanent type. Use of local facilities nd established services available to Indians and non-Indians alike vas more effective than in previous times when unemployment was igh. The preparation of the applicants prior to departure from the eservation is becoming increasingly more effective, and trained and xperienced staff people at destination points offer the type of service vhich Indian people need for fully effective relocation.

## *ocational Training Activity*

Since adult vocational training service (authorized under P.L. 959 of the 84th Congress) was added to the program, it has been difficult to establish an orderly flow of applicants entering these training courses. Because the program is extremely popular and there ha been a heavy backlog of applicants, large numbers of enrollees hav tended to enter training early in the fiscal year.

During fiscal 1961, a new procedure was established which insure an orderly flow of new enrollees entering training. This resulte in equal and fair consideration being given to all applicants from al locations, thus enabling staff workers to offer more effective service

A survey completed in March 1961 showed that 81 percent of thos who completed institutional training under this program were place in suitable year-round jobs. The survey also showed that 52 percent of those who discontinued training for one reason or another prio to completion had accepted employment, and this fact underline the effectiveness of the counseling program which is conducted during the training period.

A summary statement of services provided by the Bureau to Indian people during fiscal 1961 in the field of relocation and training follows:

| | *Units*[1] | *Person* |
|---|---|---|
| Relocation for Employment | 1, 822 | 3, 46 |
| Relocation for Vocational Training (Institutional): | | |
| Training units carried over from previous year | 724 | 1, 520 |
| New units entered training during fiscal year 1961 | 1, 227 | 2, 576 |
| Total served during fiscal year 1961 | 1, 951 | 4, 096 |
| On-the-Job Training Services: | | |
| Training units carried over from previous year | 150 | 465 |
| New units entered training during fiscal year 1961 | 486 | 1, 661 |
| Total served during fiscal year 1961 | 636 | 2, 126 |
| Total units served by program fiscal year 1961 | 4, 409 | 9, 690 |

[1] A "unit" is either an unattached individual receiving relocation or training services or an individual together with family dependents being assisted under the program.

## *Industrial Development*

The purpose of the Bureau's Industrial Development Program is to assist the Indian people in cooperating with their neighboring communities in the development of plans and programs which will attract industry to the areas surrounding the reservations and thus provide employment opportunities and improve economic and social conditions.

During fiscal year 1961, continued emphasis was placed on (1) working with tribal leaders to explain the basic concepts of industrial development and the need for cooperation with communities near the reservations to create the proper industrial climate; (2) assisting tribal nd community groups in organizing industrial development founda-ions and similar entities in order that they will be in a better position o negotiate with industrialists interested in reservation area locations; 3) gathering necessary basic information on resources available and ssisting in the preparation of fact sheets and brochures; and (4) providing information and assistance to industries which have indicated nterest in expansion of their present production facilities in reserva-ion areas.

The growing interest of Indian tribes in industrial development is hown by the fact that the following tribal groups have taken action o earmark their own tribal funds, as indicated, for industrial development purposes:

| | |
|---|---|
| The Confederated Salish and Kootenai Tribes of the Flathead Reservation, Montana | $35,000 |
| Colorado River Tribe, Arizona | 60,000 |
| Mississippi Band of Choctaw Indians, Mississippi | 135,000 |
| Lac Courte Oreilles Band of Lake Superior Chippewa Indians, Wisconsin | 40,000 |
| Navajo Tribe, Arizona | 225,000 |
| Lac du Flambeau Band of Lake Superior Chippewa Indians, Wisconsin | 40,000 |
| Mescalero Tribe, New Mexico | 51,000 |
| Eastern Band of Cherokee Indians, North Carolina | 150,000 |
| Standing Rock Sioux Tribe, North Dakota | 770,000 |
| Three Affiliated Tribes of the Fort Berthold Reservation, North Dakota | 50,000 |

In addition, a number of other tribes are in the process of developing programs and earmarking funds for use in attracting industries to the reservation areas. The sources of the funds being programmed are from judgment awards and damages due to flooding of resources by dam construction, and from leases and royalties, and other income.

### *Industrial Promotion*

Nearly 500 meetings were held during the year with tribal groups and with civic organizations of communities near reservations to bring about a better understanding of industrial development goals and problems. As a result of the work done to date with the various tribes and communities, 66 industrial fact sheets and 31 brochures have been prepared to cover communities on or near reservations. The communities and towns within the reservation areas are cooperating to the fullest extent with the Indian tribes in developing methods of financing industrial facilities. Assistance has been given in the organization of 10 industrial development corporations with a combined capitalization of $1,850,000.

The development of overall plans for proper utilization of Indian lands which have a high degree of industrial potential is essential for use in the selection of industrial sites. With this in mind, the

Bureau contracted during the year for land use surveys for th Isleta Pueblo, New Mexico, and the Colorado River Reservation, Arizona, as well as for supplemental studies and plans for the Salt River and Gila River Reservations in Arizona.

A tourist road map of the United States, entitled Guide To Indian Reservation Areas, showing the reservations and giving a brief description of each with points of interest, was published and distributed to various Federal, State, community and other interested organizations, Tribes, and the general public, as a means of developing interest in tourist and recreational possibilities of the reservation areas. Further steps are being taken to develop the full tourist potential of the Indian reservations in order to provide additional job opportunities for the local Indians.

### *Industrial Plants Established*

During this fiscal year, nine industrial plants were completed in the reservation areas, which in full operation will provide approximately 865 jobs. About 75 percent will be occupied by Indian workers.

For example, a large midwestern manufacturer and wholesaler of fishing tackle established an assembly plant on the Pine Ridge Reservation, South Dakota, in March 1961, after negotiations with the Oglala Sioux Tribe which were instigated by the Industrial Development staff. The company manufactures fish hooks, glass rods, reels, lures, spinners, and other fishing tackle products and is expected to add certain other products as the operation develops. The company leased two reconditioned buildings from the Tribe and more space will be made available as the operation expands. Starting in January 1961 as a pilot project with 12 Indian employees, the operation expanded to about 180 employees doing both hand and machine operations by June 1961. Anticipated expansion will provide employment for more than 260 persons during 1961–62. Company officials have found the Indian workers to be capable, enthusiastic, and particularly adapted to skilled handwork.

Another example is the charcoal briquetting plant established on a site at Pablo, Mont., on the Flathead Indian Reservation, as a result of negotiations carried on by Industrial Development personnel with the parties involved. The plant uses sawmill waste materials in the production of briquettes. The Tribe erected and leased two buildings to the company and operations began in December 1960, with 14 employees, 9 of whom were Indian. The plant is now in full operation with about 34 Indian workers. Local Indians are given preference for employment.

At McLaughlin, S. Dak., a large manufacturer of quilting and other soft goods leased a 20,000 sq. ft. building constructed by the Standing Rock Sioux Tribe. The plant was completed in June 1961, and the dedication was scheduled for July 7, 1961. Initially the company is employing about 25–30 Indian workers and this number will be expanded as demand warrants to approximately 75 workers.

A basket manufacturing company was located at Reserve, Wis., on the Lac Courte Oreilles Reservation. The plant was installed in a remodeled tribal building and began operations in August 1960 with 2 employees, 30 of whom were local Indians. It was destroyed by fire in October 1960 but a new building was constructed and operations began again in March 1961. The work force consists of 37 Indian employees and expansion is contemplated as the markets develop.

## Realty

At the close of the 1961 fiscal year the Bureau was exercising trust responsibilities for 52,157,852.99 acres of Indian-owned land throughout the United States. Included in the total were 40,537,761.77 acres beneficially owned by tribes or tribal groups and 11,620,091.22 acres of allotted land beneficially owned by individual Indians. Because of a continuing trend toward disposal of allotments and enlargement of tribal holdings, the allotted acreage was somewhat smaller and the tribal acreage somewhat larger than they have been in recent years.

### *Acquisition and Disposal*

Altogether 14,466 transactions involving land acquisitions and disposals, including 1,974 probate inventories, were processed by the Bureau during fiscal 1961. Approximately 130,000 acres were acquired through purchases and exchanges by individual Indians and tribes during the year, while some 1,090,000 acres of trust or restricted lands were removed from Bureau supervision during the same period. The termination program at the Menominee Reservation and the sale of Klamath tribal lands pursuant to the Klamath termination program accounted for approximately 759,000 acres of this total.

Approximately 53,000 acres were removed from Bureau supervision by the placing of unrestricted title in the hands of competent Indian owners at their request. The balance of the acreage consisted of other minor tribal land dispositions and disposals made at the request of Indian owners.

Sales to unrestricted status at the request of Indian owners accounted for 1,533 approved transactions; issuance of fee patents to

Indian owners, removals of restrictions and certificates of competenc for 849; exchanges and partitions for 1,151; purchases for 682; an other miscellaneous transactions for 3,104. The Bureau also processed an additional 5,173 realty applications which resulted in n transfer of property rights for the reason that the applications wer either disapproved or withdrawn.

## *Oil and Gas Activity*

Although there have been some oil and gas lease sales of specia interest, the lessees are continuing to evaluate their leases and surrender those not regarded as desirable. Bonuses in excess of $2½ million were paid for Navajo leases in Utah and New Mexico. O one offering of leases for royalty bids, the high bid was 62.58 percent Bids of almost $900,000 received for Uintah and Ouray (Utah) lease show renewed interest in the area. The royalty income amounted t $31,220,847, an increase of more than a quarter of a million dollar over the prior year. Navajo lands accounted for most of the production and royalty.

The total income from oil and gas development amounted t $44,396,987, almost $3½ million below the previous year. This reduction resulted mainly from the few leases sold and the surrende of leases which reduced the rental income.

During the year, the royalty rate was increased from 12½ percen to 16⅔ percent on future leases. Prior to the increase, the rate o 16⅔ percent had been in effect on the Osage Reservation for man years and for a short period on the Navajo and Wind Rive Reservations.

Waterflood plans under consideration for Navajo, Wind Rive (Wyoming) and Blackfeet (Montana) lands indicate a new era o production for these reservations.

## *Other Minerals*

The income from minerals other than oil and gas amounted t $3,196,615, an increase of more than $500,000. The major portio of this income resulted from uranium operations on the Lagun Pueblo and the Navajo and Spokane (Washington) Reservations. A royalty reduction for low-grade uranium ore on the Navajo Reservation increased the mining interest on the reservation. The Fort Hal Reservation (Idaho) continues to return a sizable income from phosphate operations. Due to low prices for ore the marginal lead an zinc mines on the Quapaw Reservation have temporarily suspende operations.

Contracts were approved for the construction of the Four Corners Power Project on th Navajo Reservation near Fruitland, San Juan County, N. Mex., which will include a 350 KV plant. The plant will use considerable coal produced by a major concern operating under a Navajo tribal lease. Construction of the power plant began n January. It is hoped that the project will serve to increase Indian employment.

The need for prospecting with a view to obtaining as much informaion as possible about the mineral resources of Indian reservations has been generally recognized. Fortunately, major companies have shown interest and two preferential prospecting permits covering arge areas were granted. One covered the entire San Carlos Reservaion and the other covered a large area comprising a known iron ore deposit on the Fort Apache Reservation, both in Arizona. At the iscal year's end a similar permit was under consideration on the Papago Reservation.

## *Records and Management*

In fiscal 1961, the Records Section continued to develop, and began o actually operate, its Land Records Improvement Program. This program is a phased project designed to clarify and modernize the titles to Indian lands and to institute a systematic method of maintaining current title information. The fullest advantage possible is taken of electronic data processing systems to insure accuracy and speed of operation.

During the year, the Bureau closed 1,835 cases granting rights-of-way over Indian lands for various purposes. Present statutory authority vests the power to grant rights-of-way over or across Indian lands in the Secretary of the Interior. With some exceptions, specifically mentioned by the statute, the grant of rights-of-way may be made only with the approval of the Indian owners. The authority of the Secretary to grant rights-of-way, when such grants are in accordance with the prescribed regulations, has been delegated to the operative field level.

At the close of the year there were 33,605 surface leases or permits of all kinds in force on Indian lands, covering 4,165,057 acres and providing an annual rental of $10,759,888 for the Indian owners. These leases and permits cover the use of Indian lands for farm, farm-pasture, grazing, and business purposes. They do not include lands incorporated in range units.

The long-term leasing act of August 9, 1955, as amended, is responsible for a continued increase in the leasing revenue to Indians. Leases for business, residential, recreational and other improvement purposes reached a total of 4,616 at the end of fiscal year 1961, with an income to the Indians for the year in the amount of $1,147,572.

## *Recreation Developments*

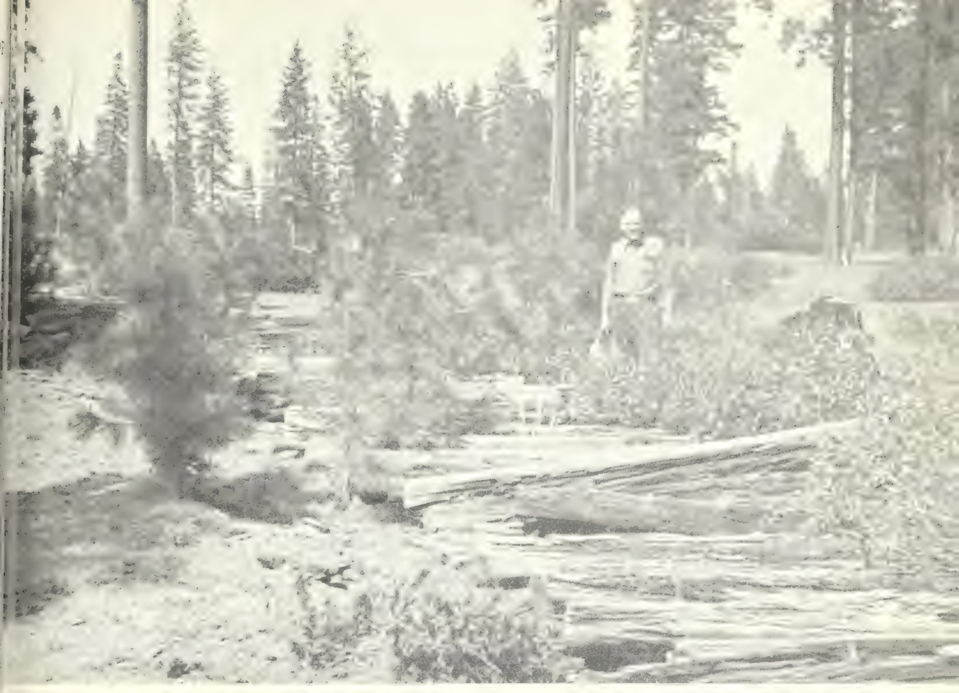
One of the most promising trends of the year was the tremendously increased interest shown by the general public and by Indian tribes in the development of recreational facilities on Indian lands. Manifestations of this interest, many of which are still in the initial stages included offers to lease sizable lakeshore acreages on the Pyramid Lake Reservation in Nevada; inquiries about areas situated along the Colorado River on the Fort Mohave Indian Reservation in California, Nevada and Arizona; continuing development of tourist facilities on the Eastern Cherokee Reservation in North Carolina; and new recreational development on the Dania Reservation north of Miami, Florida.

In all of these areas the interest is in developing facilities commercially under long-term lease contracts. Along with this there has been a growing interest in tribally sponsored and financed development of recreational potential in such areas as the several reservations adjoining reservoirs constructed by the Corps of Engineers for control of the Missouri River (Fort Berthold in North Dakota and some of the Sioux Reservation in South Dakota).

This type of tribal development of recreational potential was to a large extent spearheaded by the Fort Apache Tribe in Arizona with the construction of artificial lakes and reservoirs within its reservation, the initial development being known as Hawley Lake, previously reported. This tribe is actively engaged in planning further similar development of its strategically located natural resources for recreation. Many reservations have over the years made their superior hunting and fishing facilities available to their non-Indian neighbors on a special license basis. The population explosion as it effects the western states will inevitably increase the demand for all types of recreational development.

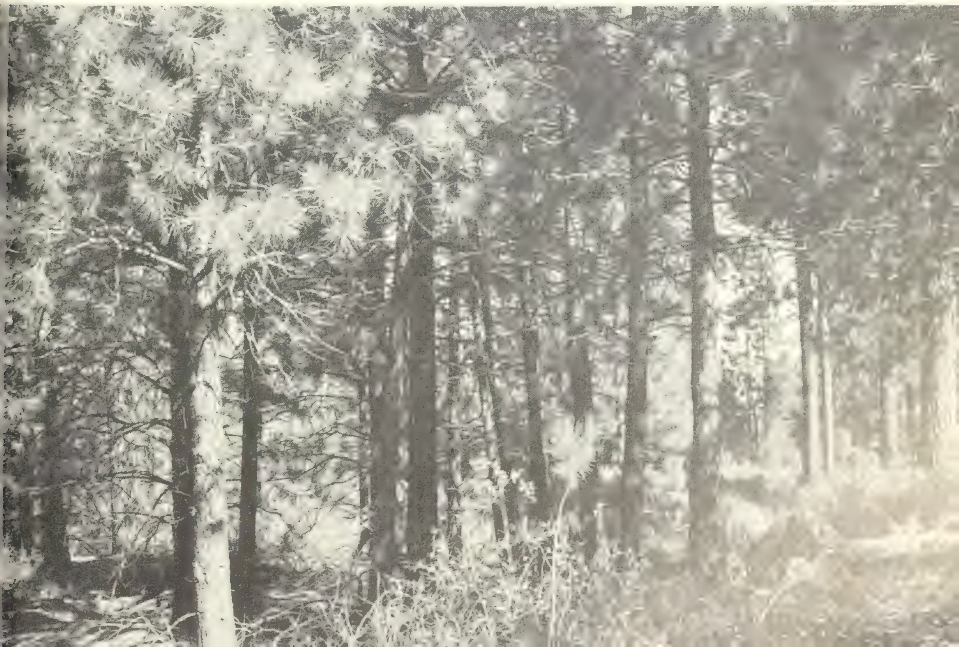
## *Forestry*

Late in fiscal 1961, Federal trusteeship over the Menominee and Klamath Indians was terminated by operation of Public Laws 83–399 and 83–587, as amended. For about 50 years preceding termination, the forest on each of these reservations had been managed by the Bureau of Indian Affairs as income producing properties. During this period, nearly 5 billion board feet of timber was sold



*Top—This picture, taken in 1934, shows Indian forest lands just 9 years after logging under a sustained yield program of management carried out by the Bureau of Indian Affairs.*

*Bottom—Here we see the same part of the Indian forest—20-odd years after the earlier logging operation, showing vividly how timber growth has recovered under the Bureau's forest management program.*



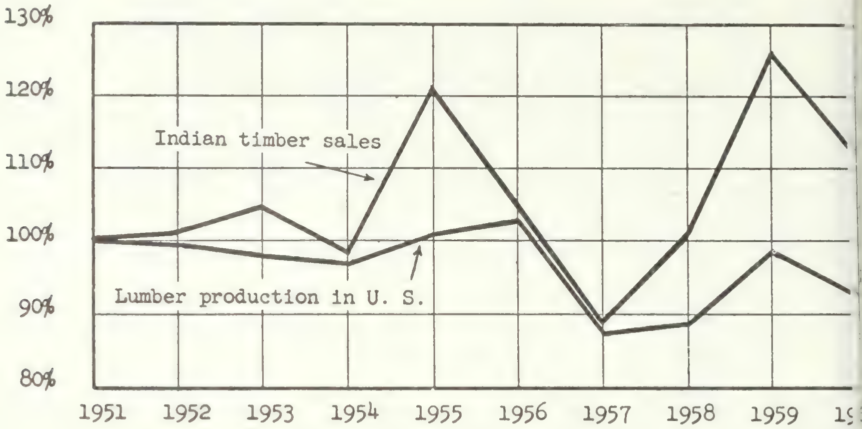


Figure 1. *Indian timber sales far outstrip lumber production in the United State*

from the Klamath Reservation for a total of $42 million. On th Menominee Reservation more than 1 billion board feet of standin timber was cut and processed through the Menominee Tribal Sawmill. For the timber the sawmill paid the Menominee Tribe mor than $10,600,000.

Informed public opinion places the Menominee and Klamath Reservation forests today among the most important and valuable i their respective areas. The present condition of these forests, following a half-century of use to produce income, vindicates the sustained-yield principles under which they were managed. These sam general principles of sustained-yield management are being applie to the 5.7 million acres of commercially important Indian forest that are still under Bureau supervision.

## *Timber Sales*

As a result of unfavorable markets in the forest products industries the demand for Indian timber dropped off in comparison with th previous year. The 474 million board feet of timber cut and pai for in fiscal 1961 was 18 percent below the record-high volume o 1960. Cash income in 1961 was $8,141,000 or 31 percent below th preceding year and the average price received was $17.16 pe thousand board feet compared with $20.63.[1]

In recent years, new forest inventories have revealed greater volumes of timber available for cutting than had previously been estimated. Plans were therefore made to increase the annual cut at several reservations. The increases have been accomplished except s these plans have been affected by depressed conditions in the forest roducts industries. Figure I and table A show the 10-year trend y calendar years in volume of Indian timber cut, and the comparable rend in total production of lumber in the United States. They reeal (a) that the volume of Indian timber sold from year-to-year enerally follows the trend of lumber production in the United States nd (b) that, despite these fluctuations caused by general business onditions, there has been an upward trend in the volume of Indian imber sales.

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[1] These figures are exclusive of Klamath and Menominee Reservations.

Table A shows, in addition, that cash income from Indian timber ales has increased to a much greater degree than the volume of sales, ecause of substantial increases in the average price per thousand oard feet received in these sales.

TABLE A.—*Sales of Indian timber and lumber productions in United States (by calendar years)*

| Calender year | Indian timber cut under contract (exclusive of Klamath and Menominee Reservations) | | | | Lumber produced in United States | |
|---|---|---|---|---|---|---|
| | Volume | | Value | | | |
| | Thousand board feet | Percent of 1951 | Cash receipts | Percent of 1951 | Million board feet | Percent of 1951 |
| 951 | 464, 126 | 100. 0 | $4, 680, 078 | 100. 0 | 37, 515 | 100. 0 |
| 952 | 467, 641 | 100. 8 | 5, 941, 686 | 127. 0 | 37, 462 | 99. 9 |
| 953 | 484, 986 | 104. 5 | 6, 809, 266 | 145. 5 | 36, 742 | 97. 9 |
| 954 | 456, 185 | 98. 3 | 6, 788, 667 | 145. 1 | 36, 356 | 96. 9 |
| 955 | 560, 479 | 120. 8 | 8, 181, 949 | 174. 8 | 37, 858 | 100. 9 |
| 956 | 487, 445 | 105. 0 | 9, 269, 392 | 198. 1 | 38, 629 | 103. 0 |
| 957 | 412, 292 | 88. 8 | 7, 942, 752 | 169. 7 | 32, 901 | 87. 7 |
| 958 | 467, 376 | 100. 7 | 8, 540, 100 | 182. 5 | 33, 385 | 89. 0 |
| 959 | 585, 239 | 126. 1 | 11, 614, 280 | 248. 2 | 37, 055 | 98. 8 |
| 960 | 517, 743 | 111. 6 | 10, 287, 928 | 219. 8 | 34, 737 | 92. 6 |

## *Forest and Range Fires*

During calendar year 1960, high temperatures and prolonged dry spells created a serious fire situation throughout much of the country. In that year, the Bureau of Indian Affairs took action on 1,467 fires. These fires burned more than 130,000 acres, including 25,000 acres of timberland. More than $1,100,000 was spent to suppress them.

The area burned was less than one-quarter of 1 percent of the area requiring protection. But for the 10-year period, 1951 to 1960, the 1960 year ranked first in number of fires, second in total acres burned, and second in average acres per fire. By a wide margin, 1960 was first in total fire suppression costs, and in average cost per acre burned. Even with this unhappy record, however, the Bureau of Indian Affairs was more fortunate than some other land managing agencies. It was a bad fire year generally throughout the country.

### *Timber Sales and Employment*

Contracts for the sale of Indian timber provide that the purchase shall employ Indian labor in preference to other labor not already i his employ whenever Indian labor seeks employment and is competent. Ordinarily, however, the Indians have not taken full advantage of this provision, and relatively few Indians are working fo the timber purchasers.

The Bureau has begun a review of forest management program at each reservation having important forest resources to determine th intensity of management that will provide the greatest return to th Indian owners in terms of stumpage income, employment opportunities and community stabilization. It is expected that one result o this study will be the development of cooperative plans, by the Bureau, tribal representatives and industry, to awaken interest in thi employment among the Indians, and to screen applicants into th particular jobs for which they are or may become best qualified.

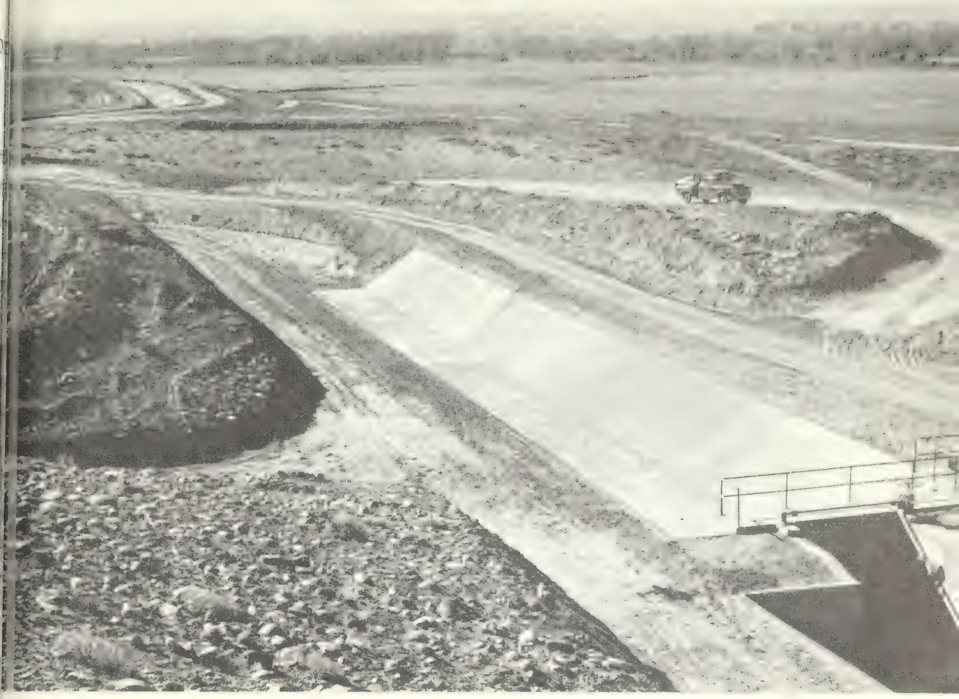
## *Irrigation Activities*

During fiscal 1961, extensive studies (including surveys, investigations, and plans) were initiated to establish a program for (1) completing existing Indian irrigation projects, (2) developing additiona Indian irrigation resources requiring authorization by the Congress and (3) rehabilitating and improving existing irrigation works with a view to transferring the operation and maintenance of projects from the Federal Government to acceptable water-user organizations Considerable emphasis has been placed on this program. When completed, the reports will provide firm ultimate project acreages as wel as an inventory of project needs and programs for the development of proposed project facilities and the rehabilitation and betterment of existing project facilities. It is anticipated that all project reports will be completed during fiscal 1963.

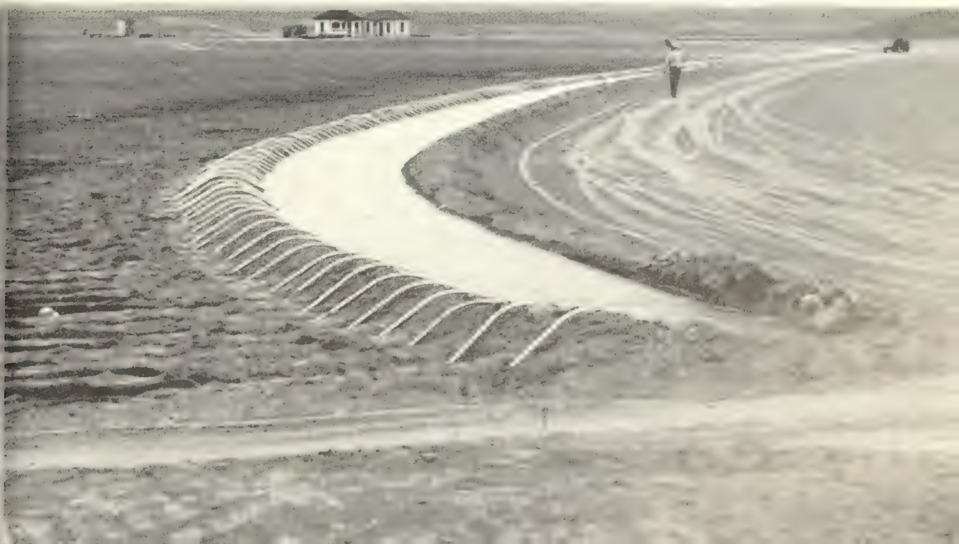
Legislation to authorize the proposed Navajo Indian irrigation project embracing approximately 110,000 acres of land on the Navajo Reservation was pending in Congress at the close of the reporting period. If authorized, the project will provide irrigated farm lands for about 1,120 additional Navajo families.

Major items of construction and rehabilitation work under way during 1961 include the following:

*Arizona:* Colorado River Project—Construction of deep drains and construction of large main canal structure. San Carlos Project—



*anal for conveyance of irrigation water over rough desert to irrigated lands elow where Navajo Indian is applying water carried by this canal in equal controlled flows through siphons to individual crop rows.*



Drilling and equipping of deep wells and rehabilitation of existing wells.

*California:* Coachella Valley Project—Construction of laterals and drainage system.

*Idaho:* Michaud Unit, Fort Hall Project—Construction of drains, canals, and structures; and installation of concrete pipe.

*Nevada:* Duck Valley Project—Land development.

*New Mexico:* Hogback Unit, Navajo Reservation Project—Land development, extension of main canal, construction of drainage ditches, and construction of wasteway structures. Middle Rio Grande Pueblos—Land Development and construction of main service canals.

In addition to conducting studies for the preparation of feasibility, completion (definite plan) and rehabilitation reports, as well as the development and management of Indian irrigation projects, a great deal of time and work has been spent on protecting Indian water rights through court action and state compacts. Some of the major water rights litigation include *Arizona* vs. *California*, the Ahtanum suit, and the Anadarko suit. None of these actions advanced to final ruling in the reporting period. Bureau officials are also involved in the development of interstate water compacts between California and Nevada, California and Oregon, and Nebraska, Wyoming and South Dakota.

## *Agricultural Extension*

In fiscal 1961 more than 10,500 meetings were held by Bureau technicians, county agents, and land grant college extension service specialists. These meetings, attended by approximately 250,000 Indian people, were held for the purpose of giving demonstrations, holding discussions, conducting work shops or giving instructions in an effort to promote incentives which will result in better living conditions among Indian families.

In addition to group meetings, individual farm and home calls are made by extension agents to stimulate interest in community activities, improved livestock and crop production and home management practices. The subject selected by Indians in which they desire assistance and information varies greatly among tribes and community groups. Extension services have been instrumental in organizing community effort in order that they may take advantage of non-agricultural economic development, which furnishes employment to their members.

*Community-sponsored wool schools have created interest among the Navajos. Local people have a sense of pride in the success of such training meetings. Here a Navajo sheep owner discourses on the merits of these four separate wool clips.*

### *4–H Club Program*

Along with these adult extension activities there were approximately 10,000 Indian boys and girls throughout the country participating in 4–H Club activities on the same basis as non-Indian boys and girls. Many of these 4–H Club members have received county and statewide recognition for their achievements in project completions and in giving demonstrations.

## *Soil and Moisture Conservation*

The soil and moisture conservation movement has been very popular in the United States since passage of the basic Soil Conservation Act of 1953. The program is much newer, however, on Indian lands. The first token appropriation for soil and moisture conservation work on Indian land was in 1942. Even in the early 1950's there were still some Indian reservations that did not have an SMC program. Today the program is active on all Indian land held in trust. In 1961 the Bureau spent $5,080,163 and the land users spent $21,819,086 in labor and material in applying conservation practices on Indian land.

Increasing demands for soils information necessary for farm, ranch, watershed and reservation planning prompted the Bureau in the early 1950's to increase its staff of soils technicians assigned to

*A group of Osage Indians being assisted by a Bureau Soil Conservationist in farm and ranch planning. This will enable them to conserve their soil and moisture and increase crop and forage production.*

inventory work. By 1956 high-quality soil inventories were available for approximately 6,437,000 acres of Indian lands.

In 1957 the inventory program was expanded to include forage resources since the latter information was also essential in order to properly plan utilization of range lands. The program was also intensified to complete the mapping phase at the earliest possible date because several tribes were requesting the inventories to use in overall planning. At the same time added emphasis was placed on helping the Indians to understand and use the information in preparing plans for the development and utilization of their soil, water and forage resources.

By July 1, 1961, the Bureau had completed approximately 13 million additional acres of soil inventories and a similar amount of range inventories of Indian lands. In total, high-quality soil inventories are now available for roughly 19,500,000 acres. This represents completion of approximately 47.5 percent of the 41 million acres of open Indian land needing to be mapped. Since 1959 the program has been progressing at the rate of approximately 3½ million acres per year. This rate of progress will allow completion of the mapping phase of the work by 1967.

The interpretation phase of the inventory program, involving the teaching of Indian people to use the information, has progressed but not at the rate of the mapping. Increased emphasis is being put on this part of the work each year.

## *Range Management*

Progress was made in range management during 1960 in the face of continued drought. Indicative of progress was the action of the Mescalero Tribe in New Mexico in retaining a commercial management firm to prepare a management plan for the Indian livestock business, and the employment of a livestock manager. Several of the Pueblo Tribes in New Mexico have adopted range management plans and voluntarily reduced their livestock numbers in response to advice of Bureau range specialists. The Southern Ute and Ute Mountain Tribes of Colorado and the Apaches of New Mexico are taking steps to place their range lands under good management. Educational work with the Indians is receiving increased emphasis.

### *Drought Conditions*

Drought conditions have continued not only in the southwest but in the Dakotas and eastern Montana. This has resulted in reduced forage production and scarcity of water for range livestock. Little damage has resulted to the forage cover in the Northern Great Plains due to past conservative management designed to meet periodic drought conditions. Drought continues, however, to be severe on a number of the southwestern reservations where livestock numbers in excess of grazing capacities further complicate the situation. It was necessary for the Department of Agriculture to continue its free feed-grain program on a number of these reservations.

Indian livestock operators used 83 percent of their range. Grazing privileges not immediately needed by the Indians were sold to non-Indians through competitive bidding. The rates received compare favorably with the highest rates received on other lands in the respective states.

The range for 1960 was used as follows:

| | Acres (thousands) | Percent of acreage used | Animal units grazed (thousands) | Use value (thousands) |
|---|---|---|---|---|
| Total range | 40, 942 | | | |
| Total use | 40, 412 | 100 | 748 | $6, 038 |
| Non-Indian use | 6, 376 | 16 | 306 | 1, 996 |
| Indian use | 34, 046 | 83 | 442 | 4, 042 |
| Not used | 530 | 1 | | |

*Top—Improved pastures developed with technical assistance furnished by the Bureau of Indian Affairs are producing up to 800 pounds of beef per acre. Seminole stockmen are selling 400-pound calves at 6 to 7 months of age and are now getting an 80-percent calf crop on the improved pastures.*

*Bottom—Before the soil and moisture conservation program was started among the Seminole Indians of Florida, their cattle were ranging in the Everglades, as shown, getting about a 20-percent calf crop, 9 pounds of beef per acre, and selling year-old calves weighing 255 pounds.*

## *Roads*

The Bureau's road program includes both construction and maintenance of certain roads serving Indian lands. The program in fiscal 1961 totaled $21.2 million and was active on 160 reservations in 21 States.

The $2.8 million road maintenance program provided routine maintenance on 16,216 miles of reservation roads and bridges. Maintenance work included surface repairs, blading, repairs to drainage, clearing of right of way, and snow removal. All work under this program was performed with reservation equipment and government forces.

The road construction program consisted of $4 million for Navajo-Hopi, Routes 1 and 3, as provided by Public Law 85–740, an amendment to the Navajo-Hopi Rehabilitation Act; and $14.4 million for the Bureau system as authorized by the Federal-Aid Highway Act of 1958.

There were 172 projects ranging in cost from $5,000 to $976,000 in this construction program. All engineering projects and some of the smaller construction projects were completed with government forces. Most of the projects were advertised for contract with some contracts covering two or more projects. Sixty-two contracts were awarded at $5,000 to $100,000; 31 at $100,001 to $500,000; and 9 at over $500,000.

The construction work accomplished during the year on all reservations included 319 miles of grading and draining; 264 miles of gravel surfacing; 268 miles of asphalt surfacing; 2,916 feet of bridges; 647 miles of surveys and plans for future projects.

Progress on Routes 1 and 3 on the Navajo and Hopi Indian Reservations was on schedule. Sections on Route 1 between Tuba City, Ariz., and Kayenta, Ariz., were either completed or under contract. On the eastern end, the sections between the New Mexico-Arizona State line and Mexican Water, Ariz., were either completed or under contract. The remaining unimproved section of Route 1 is between Kayenta and Mexican Water. Route 3, beginning at Tuba City, Ariz., and extending easterly across the Navajo and Hopi Reservations is asphalt-surfaced for the entire length but is being widened and resurfaced in accordance with State highway standards.

As part of the Menominee Termination Program, the Bureau entered into an agreement with the State of Wisconsin providing for transfer to the State of all Federal public roads on the Menominee Reservation and their designation as State, county, or township roads. The Bureau agreed to provide the rights-of-way and to re-construct certain roads. All work required of the Bureau under th agreement was completed or under contract at the termination da on April 30, 1961.

## *Arts and Crafts*

The Indian Arts and Crafts Board has the responsibility of pr moting the economic welfare of Indian tribes through the develo ment of their arts and crafts. It provides technical advice an assistance in production and marketing to Indian crafts groups an to individual Indian artists and craftsmen.

The Seminole crafts program was taken over by the Seminole Tri in 1960 and became a part of the tribal enterprise system. In line wit the request of the Tribe, the Indian Arts and Crafts Board has co tinued to provide advice and assistance through the services of a arts and crafts specialist. Reports from this group indicate that t volume of business has increased during the year and the craft shop rapidly becoming a well-known State attraction.

This has been an important year for the Qualla Arts and Craf Mutual at Cherokee, N.C., which has now spent one year in its ne $50,000 highway sales center building. In addition to an increase i sales, this group has had a number of important exhibits during t year.

### *Sioux Craft Activity*

At the Sioux Exhibit and Craft Center, Rapid City, S. Dak., a con plete card index and accession book was compiled on the collection 1,200 artifacts. An anthropologist familiar with Sioux India history and an expert in the Sioux language has prepared labels f the museum specimens with the correct Sioux name, both in the usu spelling and in the phonetical spelling used in linguistics. T various reservations in the area are showing increased interest craft production and the arts and crafts specialists are making p riodic visits to these reservations to advise and assist in the establis ment of craft organizations.

For the Southern Plains Exhibit and Craft Center at Anadark Okla., this has been a year of growth and advancement. There h been an increasing demand for high quality Indian crafts and this h resulted in increased business for the cooperatives. A number special exhibits have been held during the year and it is gratifyi to note the interest the Indian people in the vicinity take in the exhibits.

An arts and crafts specialist has been appointed to give direct ssistance to the Hopi craftmen in Arizona. Various improvements ave been made on the quonset hut where the Hopi Silvercraft Guild s located, thereby making the operation of the Guild much more ffective. As a result of this assistance, the Hopi Guild has had a ery successful year as far as sales are concerned.

## *Credit Activities*

Further progress was made during 1960 in the financing of Indians, espite a general tightening up of credit by the lending institutions hat serve citizens generally and a shortage of funds available for oans through the Bureau. The rate of progress, however, slowed own. Financing of Indians through customary institutions increased early 11 percent in 1959 over 1958. In 1960, the increase was only bout 7 percent. This situation caused a greater demand for loans pon the Bureau which it was unable to meet.

Nevertheless, the Indians continued to be better financed in 1960 han probably at any time in their history. Total financing increased rom about $100,360,000 in 1959 to $107,344,000 in 1960.

### ***inancing Through Customary Financial Institutions***

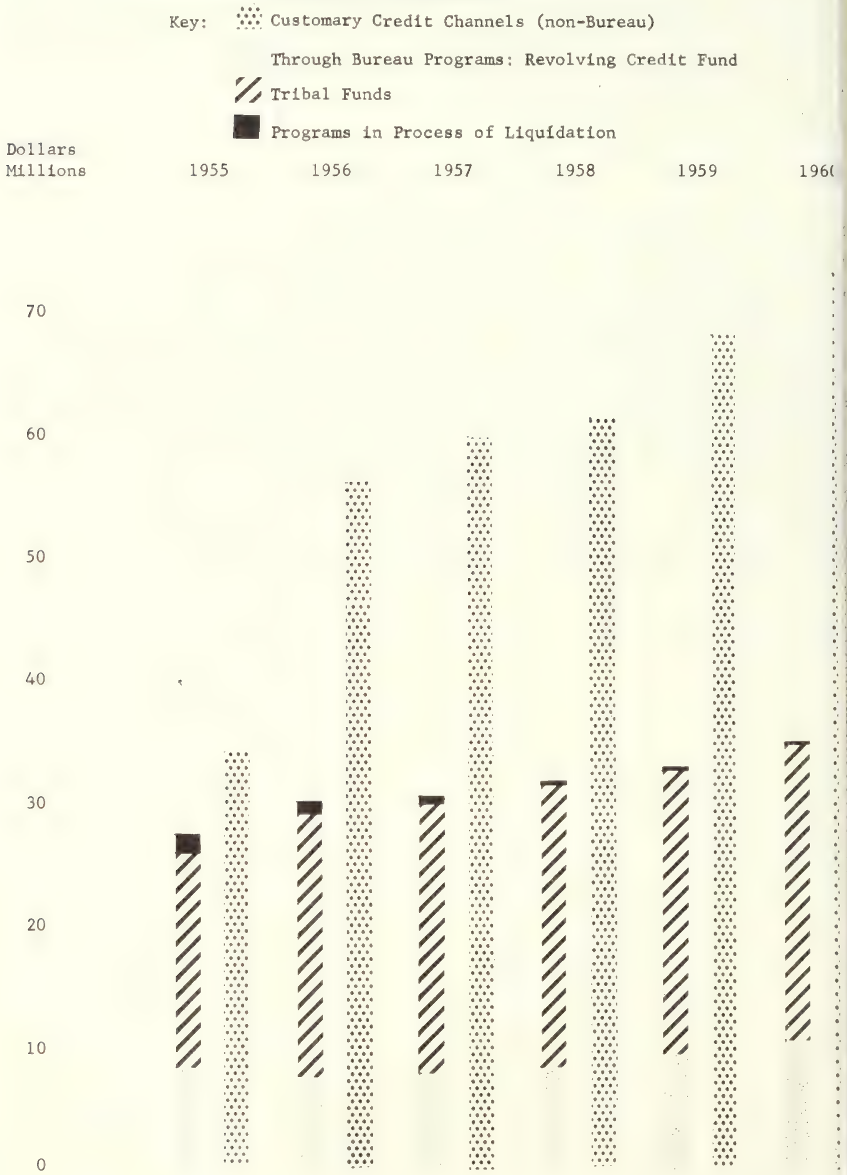
Total financing through customary institutions increased from about 67,670,000 in 1959 to about $72,620,000 in 1960. Lenders in the areas vhere Indians live are becoming more and more conscious of the credit eeds of the Indians.

Financing by banks showed a satisfactory increase over 1959—bout 18 percent. Loans to Indians by the Farmers Home Administra-ion showed a decrease of about 5 percent from 1959, and loans by roduction credit associations a decrease of about 3 percent.

There were 135 loans outstanding at the close of the year with an npaid balance of $815,334 secured by mortages of trust land approved ursuant to the Act of March 29, 1956 (25 U.S.C. 483a). The unpaid alance at the close of the previous year was $579,010.

The number of Indians desiring to use their chief asset, land, as ecurity for loans is constantly increasing. Although the authority to pledge Indian land as collateral provides a worthwhile means of ssisting the Indians to obtain justified financing, continued vigilance s necessary to prevent this authority from becoming merely a mechanism whereby improvident Indians may unwisely be separated from heir land.

COMPARATIVE SUMMARY OF FINANCING RECEIVED BY INDIANS
AND THEIR ORGANIZATIONS



## *Financing Through Bureau*

The following shows the total financing through the Bureau outtanding at the close of the past two years:

| | *1959* | *1960* |
|---|---|---|
| Tribal funds advanced | $22, 972, 052 | $23, 982, 484 |
| Loans of revolving funds | 9, 515, 749 | 10, 572, 318 |
| Programs being liquidated | 202, 433 | 168, 963 |
| Total | 32, 690, 234 | 34, 723, 765 |

Tribes with funds of their own available for financing are required o use their own money before applying for loans from the United States. Such funds are used for the same purposes as loans from the revolving fund.

The volume of loans from the revolving fund in 1960 was the second argest in any year since the fund was established. In 1950, the peak year, $3,274,070 was loaned. By comparison the 1960 amount was $3,145,375. Repayments on principal in 1960 totaled $2,084,271 and $4,535 was cancelled. The net increase in loans receivable over 1959 was $1,056,569.

Since the demand for loans in 1960 far exceeded the funds available, t was necessary to curtail the submittal of applications for additional oans during the year.

*Use made of funds loaned and tribal funds advanced*

| | *Balance at—* | |
|---|---|---|
| | *June 30, 1959* | *June 30, 1960* |
| Loaned to individual Indians | $7, 885, 484 | $8, 858, 065 |
| Loaned to cooperatives | 191, 554 | 224, 651 |
| Loaned to and invested in enterprises | 19, 442, 772 | 20, 795, 623 |
| Loans to attract industries | 129, 830 | 284, 281 |
| Other loans and miscellaneous | 126, 147 | 119, 787 |
| Cash on hand | 3, 147, 892 | 2, 610, 489 |
| Other net assets | 1, 766, 555 | 1, 830, 869 |
| Total | 32, 690, 234 | 34, 723, 765 |

Transactions during 1960 are summarized as follows:

| | |
|---|---|
| Loaned to individual Indians | 3, 819, 669 |
| Loaned to cooperatives | 39, 984 |
| Financing of enterprises | 2, 134, 301 |
| Total | 5, 993, 954 |

## *Loans Made in Alaska*

Loans made in Alaska have impaired the soundness of the revolving fund. Of the $10,572,318 outstanding in loans, $5,274,115 was on loans made in Alaska.

These loans fall into the following categories:

| | |
|---|---|
| 1. Loans to Native villages for the operation of stores and trading posts | $424, 800 |
| 2. Loans for relending to members and miscellaneous | 403, 653 |
| 3. Loans to villages to operate salmon canneries | 4, 444, 662 |
| | 5, 274, 115 |

The first category of loans to villages to operate stores and trading posts has been successful. The economic life in many of these remote villages centers around the store or trading post. This part of the program beneficially affects a larger number of people than other parts of the program.

Potential losses on loans in the second category are higher than those on loans made elsewhere, due mainly to poor fishing seasons in southeastern Alaska. However, losses will not be so high as to impair the soundness of the revolving fund.

The loans in the third category constitute the problem area. Because of the large amount of funds necessary to finance canneries and because their operations have been generally unsuccessful, the soundness of the revolving fund has been impaired. The liabilities of the canneries exceeded their assets by more than $1 million at the close of the fiscal year. The interests of the United States in its loans has become progressively less secure from year to year. Present indications are that large losses will be suffered.

## *Plant Design and Construction*

In fiscal 1961, the Bureau completed 20 school projects which made available 2,274 additional classroom seats for Indian children previously unable to attend school for the lack of classroom space Twenty-one other school projects with a total of 1,633 additional seat were started but not completed during this same period.

Construction was also in progress on 28 miscellaneous projects, including employee housing, sanitary facilities, water exploration and jails.

The Bureau assisted the Division of Indian Health, U.S. Public Health Service, by completing the design and construction of 6 hospitals and 3 miscellaneous projects as well as starting the construction of 14 other health projects, which included several hospitals and clinics

# Bureau of Land Management

Karl S. Landstrom, *Director*

Fiscal Year 1961 was a milestone of progressive advancement in the conservation, administration, and utilization of public lands and natural resources under jurisdiction of the Department's Bureau of Land Management. New directions were charted for the conservation, management, and use of more than 477 million acres of land owned by all citizens of the United States.

Responsible for the management of the national land reserve of 168 million acres, plus nearly 310 million other acres in Federal ownership, the Department of the Interior, through its Bureau of Land Management, took bold action to insure protection of the public's vital interest in these important natural resources—many of which, a few years ago, were considered useless and without values.

## Lands and Recreation

> *"The Federal Government owns nearly 770 million acres of public land, much of it is devoted to a variety of essential uses. But equally important are the vacant, unappropriated and unreserved public domain lands, amounting to some 477 million acres—a vital national reserve that should be devoted to productive use now and maintained for future generations."*

Thus, President John F. Kennedy defined conservation goals and spelled out objectives for improvement and protection of the public domain, recognizing that wise investment in a land resource program will return vast dividends tomorrow and that failure to act now may be opportunity lost forever.

### *Public Interest Paramount*

The Department ordered an 18-month moratorium on most type of applications for public lands under the nonmineral public lan laws. This temporary suspension, which terminates on September 1 1962, is permitting the Bureau of Land Management to eliminat existing backlogs, review the entire land management picture, an implement long-range and resource management programs of th Department of the Interior.

In recent years, some unethical land locators and promoters hav abused the privilege of filing applications and petitions for publi lands at a cost of millions of dollars to the public. With district lan offices flooded with promoter-inspired applications, honest citizen were hampered in their legitimate desires to acquire public lands.

### *Action for Conservation*

A major step toward protection of the public interest was th adoption of a public land conservation program governing all transfers of land out of Federal ownership. Under this program, th Government must receive a full return for its property in terms o money—or other values—and any disposition or lease of public land must meet the test of serving the public interest.

Under this conservation program, lands which cannot properl be developed under existing public land laws will be retained in Federal ownership pending enactment of appropriate legislation. Privat exchanges will be approved only where acquisition of the offered land will yield substantial benefits to long-range Federal land and resourc management.

Entries under the agricultural land laws are now prohibited i areas where they would be inconsistent with national agricultura policy or would lead to marginal or submarginal crop production By this means, activities of the Bureau of Land Management ar coordinated with programs of the Department of Agriculture. I addition, lands which are more valuable for other uses will not b classified for agricultural entry.

### *Land Inventory and Classification*

The President's call for an inventory and evaluation of the nation' public domain holdings brought about a land tenure analysis or inventory program. This program, called "master unit classification, recognizes that the existing pattern of land administered by BL is largely unplanned. Land use, in the past, has simply followed transfer of lands under a variety of laws, many of which have conflicting purposes.

On an orderly basis, the new program will permit needed tenure adjustments and provide a sound basis for a sustained resource management. Tenure will be secured for lands which should remain in Federal ownership. Title to those lands which are not required for Federal land programs will be transferred, and lands with significant public values will be acquired, retained, and managed.

### *Recreation*

A major requirement of an adequate nationwide system of public parks and other areas for adequate outdoor recreation is the proper use of the national land reserve.

The Bureau of Land Management works closely with State and local governments to help them meet their public recreational needs. One major means of accomplishing this is by lease or title transfer under the Recreation and Public Purposes Act. Under this law, States may purchase up to 6,400 acres a year for park purposes, except hat the limit for 1961 and 1962 was set at 12,800 acres.

To stimulate expansion of public recreational facilities, an acquisiion schedule has been adopted for public lands for outdoor recreation. State and local governments can purchase land areas from the national land reserve for $2.50 an acre, or lease them for 25 cents an acre per year. This price eliminates one of the major stumbling blocks to State and local recreation programs—their inability to finance expensive land acquisition plus necessary improvements and facilities.

Most of the lands involved are located in 11 western States and Alaska, although small acreages exist in Minnesota, Louisiana, Florda, Arkansas, Alabama, and Wisconsin.

Lands obtained under this schedule must be open to the public without discrimination or favor. As provided by a recent Act of Congress, the lands must forever be dedicated to public recreation use—otherwise, they will revert to the Government. No more than a reasonable charge may be made for use of recreation facilities, and entrance fees may not exceed those charged at similar State or local nstallations. In addition, the lands must be developed and managed n accordance with a BLM-approved program of utilization.

The new price schedule has also been extended to sites for public ducation, wildlife restoration projects, and wildland fire control tations, provided that similar requirements are met. This replaces a former policy of selling such lands at up to 50 percent of normal

*Trespass—illegal occupancy of public lands. This unsightly junkyard is in valuable public recreation area along the lower Colorado River.*

market price. In the past, a high price tag has seriously handicappe some communities seeking expansion.

In many States, there was a great deal of activity under the Recreation and Public Purposes Act. Utah initiated an active program fo developing a State park system, with over 60 sites already applie for. Several of these—including one for a scenic area on the Grea Goosenecks of the San Juan River—were transferred to the State b the Bureau of Land Management. Local governments in Nevad have applied for school sites, and the State has applied for a sizabl area for Valley of Fire State Park near Lake Mead. Washingto has leased 29 islands in Puget Sound for recreation sites.

In conjunction with the Master Unit System, an inventory of recreation lands will identify those having special attraction making ther suitable for public outdoor recreation. More than 1,000 of these area were identified during fiscal year 1961.

When areas are suitable for multiple usage, appropriate classifications will protect and administer any recreation potential. During the year, several such areas were established, including one of over 300,000 acres in the Monache-Walker Pass area of California, which was classified for retention in public ownership under section 7 of the Taylor Grazing Act. This classification provides that discretionary dispositions detrimental to public values of this area will be avoided.

## *Wildlife Conservation*

A new aspect of public land management was inaugurated during the year, when an area of 92 square miles in central California was designated the Caliente National Cooperative Land and Wildlife Management Area.

This is the first formal Federal-State land and wildlife management area in the United States. It consists of 58,868 acres of public land administered by the Bureau in cooperation with the Department's Fish and Wildlife Service and the State of California. It will be utilized to develop the recreation, wildlife, and other natural resources of the area.

Under consideration are other potential land and wildlife management areas.

## *Recreation Construction*

During the fiscal year, the Bureau of Land Management constructed camping and picnic facilities at eight recreation sites located on O&C lands in western Oregon. These were the first recreation facilities outside Alaska constructed by the Bureau. They are located adjacent to major access roads, also constructed by the Bureau, for management of forests and other resources under its jurisdiction.

Under provisions of the Recreation and Public Purposes Act, many States and counties are constructing sites adjacent to Federal, State, or county highways. There remain undeveloped, however, many desirable outdoor recreation areas in remote and uninhabited regions where there are large concentrations of public land.

Despite a lack of facilities and in many cases a lack of good roads, the recreational use of the national land reserve has accelerated very rapidly since 1950. Included are hunting, fishing, camping, hiking, picnicking, sight-seeing, rockhounding, and many other pursuits. An initial recreation inventory revealed that recreation visits exceeded 2.3 million.

One illustration is the Owens Valley in California, which is the watershed for the City of Los Angeles municipal water supply. Despite a lack of facilities, there were over 200,000 visits to the public-domain lands in this area in 1960. A lack of needed facilities resulted in unsightly and unsanitary conditions on the public lands were created. A similar situation exists along the lower Salmon River in Idaho and in many other areas in the western States.

### *Legislation*

In performing its mission of land and resource management, the Department of the Interior has been hampered by outmoded public land laws. Many of these laws are obsolete or otherwise insufficient, and they frequently reflect social and economic conditions of the last century—they no longer apply to situations of today.

Increased economic activity in public-land States has caused a growing need for land for commercial and industrial purposes. While this need exists in connection with many industries, it is particularly pressing for electronics, aircraft, and missile industries. There is no means easily available for the sale or lease of public lands, in tracts of sufficient size for these purposes. Cumbersome and roundabout methods have to be used, such as exchanges for the acquisition of suitable lands.

At the same time, there has also been an increasing demand for public lands for urban and suburban development, and for recreation purposes.

### *Land To Grow On*

To meet these and other needs, a proposed bill authorizing the classification, segregation, lease, and sale of public lands for urban, business, and occupancy sites was sent to the Congress during fiscal 1961. This bill provides for the disposition of lands at not less than their fair market value, either by direct sale of tracts to State and local governments up to 5,000 acres or by public auction of tracts up to 1,280 acres to private organizations or individuals.

All such sales would be under conditions assuring development for the purposes intended and preventing speculative ventures, in order to protect public interest in the lands.

Public interest in small tracts continued during fiscal year 1961. Emphasis on public sale, rather than leases, resulted in a decreased number of applications and an increased number of tracts transferred. Land offices at Los Angeles, Sacramento, Reno, and Phoenix held weekly auctions. As many as 3,000 tracts are currently available at the Los Angeles office, the realization of a long-sought inventory goal.

### *State Selections*

An amendment to the State selection laws resulted in some increased activity. Under this amended rule, States may select part of the lands under a Federal mineral lease, even when some of the other lands involved in the lease are not available to the State.

*A 23,000-acre grass and brush fire moves into a mature stand of ponderosa pine. Over half of the fires on BLM lands last year were caused by the carelessness of man.*

Most States have exercised nearly all selection rights, and they are being encouraged to complete selections as soon as possible. In Washington, over 30,000 acres were transferred to the State. Arizona eliminated the entire backlog of pending applications, and transferred 45,000 acres to the State.

In Alaska, the State selection program continued to dominate the activities of the Bureau of Land Management. Over 1,000 applications were on file at the close of 1961, as the State exercised selection rights granted by the Statehood Act. After early concentration on lands in the Anchorage area, the State is currently selecting large areas in the Fairbanks area. This high level of activity is expected to continue, since the State has selected only 10 percent of its congressional land grant.

## *Withdrawals and Restorations*

In 1961, steps were taken to streamline withdrawal procedures and to clarify policies in order to expedite administration. During the year, 275 public-land orders were issued, 153 of them since February 1, 1961.

Nearly 9 million acres in northern Alaska were withdrawn for the Arctic National Wildlife Range—to preserve the unique wildlife, wilderness, and recreational values of the region. At the same time approximately 20 million acres of Alaska lands, formerly withdrawn under Public Land Order No. 82, were restored to the public domain. Executive Order 8344 was revoked, so that 500,000 acres of public lands on Kodiak Island became available for State selection.

## Forest Resources

In the management of lands and resources under stewardship of the Bureau of Land Management, all phases of forestry are of major importance. Accepted projections of population expansion for the next four decades clearly challenge our ability and need to increase the quantity and quality of this vital resource.

In addition to balanced use of forest resources and the need to sustain a maximum timber yield, the Bureau of Land Management is concerned with the care and conservation of forest lands, and the protection of these lands from fire, insects, disease, trespass, and other depredations.

### Forestry Management

The national land reserve contains almost 35 million acres (exclusive of Alaska) of commercial forest land and woodland—of which 6 million acres are commercial forest lands and 29 million acres are woodlands type. The standing merchantable volume on these lands is about 109 billion board feet with 74 billion board feet of this on the commercial forest land.

The Oregon and California Railroad (O&C) grant lands are among the most intensively managed of any Federal timber holdings. During the fiscal year and during the convening of the 5th World Forestry Congress, over 100 foresters from 24 nations made a tour of these famous timber lands. As quickly as conditions permit and warrant, the remainder of the national land reserve which can support commercial timber stands will be brought under comparable intensity of management.

### Uniform Practices

An agreement to study uniform timber management practices on Federal timber lands was adopted by the Secretaries of the Interior and Agriculture. Involved were the Department's Bureau of Land

Management and its Bureau of Indian Affairs as well as the Forest Service.

Thirteen specific recommendations were agreed upon to standardize and reconcile timber sale and management practices, recognizing the necessity for bringing together widely scattered resource policies of he Federal Government existing for many years.

Among the study recommendations adopted, are orders to agencies to standardize inventory procedures, reconcile differences in determining allowable timber cut, and make detailed field studies toward possible uniform log measurement standards.

Other recommendations include possible adoption of a joint nursery program, and solutions for land jurisdictional problems in the complicated checkerboard ownership of western Oregon.

### *Timber Sales*

Many of the public lands in the West have heavy stands of timber. The regulated harvest of this timber contributes considerable revenue to Federal, State and County treasuries where the timber is located, and also contributes to the economy of nearby communities, the State, and the entire Nation.

The O&C and Coos Bay Wagon Road grant lands, of western Oregon, comprising over 2 million acres of some of the finest Federal forests in the Nation, are intensively managed by the Bureau of Land Management to obtain maximum product yield on a sustained basis. More than half of the industrial employment in Oregon is based on timber-using industries. These lands contribute about 14 percent of the total raw material used by the timber industry.

From these lands during the past year nearly 1 billion board feet of timber, valued at more than $26¼ million, was sold. This represents the full annual allowable cut of 874.2 million board feet. In addition, a volume of nearly 125 million board feet of salvage and thinning, not chargeable against the allowable cut, was produced. This supplemental volume of nearly 125 million board feet over the allowable cut represents approximately $3 million in direct payrolls to production workers in the timber industries of western Oregon.

These timber sales also contribute substantially to timber using communities. Where the need exists, the full allowable cut is offered for sale.

Over 10 percent of the timber offered for sale from the national land reserved during 1961 did not receive bids, and the values were lower than in the previous year. This lack of interest and lower prices is attributed to slowness in lumber markets during the year.

*A Bureau forester examines a blister rust canker on a young sugar pine.*

Timber sales are the largest source of revenues in the total forestry program, with receipts of nearly $6 for every dollar appropriated in fiscal year 1961.

### *Forest Thinning*

The Bureau of Land Management is engaged in commercial thinning where permitted by silvicultural and industrial needs. During the last fiscal year, there was a substantial increase in sales of such timber. In such sales, less desirable species and other trees are logged. These trees would normally die before the end of harvest or rotation age, because of growth competition, insect attack, disease, or damage.

Volumes realized from these sales were in excess of the annual sustained yield, since these trees would never have reached maturity. In addition, the residual stand of trees is vastly improved, with the final harvest yielding better and more valuable trees. Because thinning sales are made in stands of timber representing younger age classes sensitive to mechanical injury, logging is restricted to small tractors or horses in order to minimize damage to remaining trees.

Bids totaling more than $296,000 were received for the 17½ million board feet of thinnings removed from approximately 2,000 acres during fiscal year 1961.

### *Reforestation*

The future of the Bureau's forest resource management rests in its ability to successfully establish young, vigorous forest stands. During fiscal year 1961 several important steps were taken to achieve this.

For the first time, sufficient supplemental appropriations to rehabilitate burned over forest lands were obtained, almost as the embers were cooling. Funds of $225,000 were made available for snag falling, contour plowing for erosion control, tree seed and planting stock, and planting and reseeding of fire-damaged public-domain forest lands in Oregon, Idaho, Colorado, Wyoming, and Montana.

The most intensive continual reforestation of Federal lands is on the O&C grant lands. Through excellent and far-sighted cooperation of 18 western Oregon counties, money was made available by 1965, to place all reforestable acreage into full production for seeding or planting.

To insure a supply of seed and planting stock, seed banks and cooperative agreements for growing stock have been established. Under one cooperative agreement with the State of Oregon 5 million seedlings will be produced yearly for use of the Bureau of Land Management.

### *Forest Inventory*

Since there will be no significant increase in forest acreage and possibly a decrease due to urban expansion, the demand is being met by a maximum product yield in conformance with sustained yield management. A vigorous, realistic inventory must be maintained—not only to assure an orderly harvest, but also to provide foresters of the Bureau of Land Management with necessary data to recover what has previously been considered forest mortality.

The first intensive forest inventory was completed on the grant lands and intermingled public domain lands in western Oregon in 1959, and is now being conducted on 3.8 million acres of commercial timberlands in the national land reserve. This inventory is scheduled for completion in 1965. Following the trend of the western Oregon inventory, increases in annual allowable cuts may be anticipated. If the need exists, such increases will be reflected in scheduled sales of timber when the inventory is approved.

Foresters are conducting a new inventory of portions of the Bureau of Land Management western Oregon forest lands that were inventoried about 10 years ago. No marked change in the annual allowable cut is anticipated, but valuable regulatory information will be secured by this new inventory.

In executing the new inventory, a network of permanent sample plots has been established. These plots are periodically reexamined—and growth condition, stand conditions, mortality, volume, information, and other data are obtained.

### *Access Roads*

A basic requirement of forest resource management is access. Large stands of mature and over-mature timber require roads designed and built for heavy logging equipment needed to harvest the resource.

Just a decade ago the Bureau of Land Management began constructing access roads which also served other Federal and private uses as well as hunting, fishing, mining, grazing, and fire protection. In many areas, plans can be prepared without the compelling or controlling factor of road development.

Accomplishments to date include construction of 230 miles of high-standard logging roads of which 44 miles were completed during 1961. An additional 153 miles are currently under construction. A total of 152 miles have been surfaced with rock for year-round operation, of which amount 26 miles were surfaced this year. An additional 51 miles are currently under contract for rock surfacing. To reduce maintenance costs, 51 miles of timber access roads have been blacktopped, 18 miles of which were completed during 1961.

During fiscal year 1961, more than $38.4 million was appropriated for construction and acquisition of access roads. An additional $250,000 was made available for maintenance of access roads.

## *Protection of Resources*

Conservation and wise use of the Nation's public lands and resources require comprehensive, long-range plans for protection against the destructive forces of nature and the carelessness of man.

Natural resource protection covers many fields—from fighting forest fires in remote sections of northern Alaska to investigating trespass cases on the lower Colorado River. Insect and disease control are also necessary, as well as rehabilitation of lands destroyed by fire or flood.

*isease is a silent, but deadly enemy of our forests. This camp in an overmature nd of white pine along the Rogue River in western Oregon was set up by BLM combat an infestation of white pine blister rust.*

## *rotection Responsibilities*

To centralize protection responsibilities and enable the Bureau of and Management to provide professional supervision and direction all activities relating to protection of the lands and resources, a ew organizational division was established during fiscal year 1961. Protection responsibilities include fire prevention and suppression, espass, and insects, pests and disease control.

## *respass*

Primary protection responsibility is the investigation of trespass, unauthorized use of the national land reserve and its resources. here has been an intensified effort to eliminate illegal uses of public nds and resources.

Trespass includes such things as unauthorized cutting of timber, nd occupancy, disturbing the surface of public land for agricultural d nonmineral materials, burning the surface resource, and grazing forage. There are an estimated 20,000 cases of trespass on the ational land reserve.

Considerable effort was devoted to the prosecution of timbe trespass in fiscal 1961. Normally the processing of cases is delayed because of court actions, detailed cadastral surveys, and complex investigations. Collections on claims repay the loss to the taxpayers an serve as deterrent to future violations.

Action was initiated to prepare an occupancy trespass inventory fo future use. The program envisions elimination of a substantia portion of the unauthorized occupancies within 2 years.

Grazing trespass on Federal range lands was a continuing problem Penalties imposed by State law were often inadequate to discourag habitual grazing trespassers. New regulations and trespass manua instructions are serving to simplify and provide uniform trespas procedures.

### Fire Control

Fire control involved prevention, preparedness, and early suppression of all fires found upon or threatening resources on lands unde jurisdiction of the Bureau of Land Management. The fire control objective was to train, organize and develop a force to hold fire losse to a minimum.

### Fire Conditions

Fire is the principal enemy of our forests, rangelands, and watersheds. This fact was brought into sharp focus by the critical fire season early in fiscal year 1961.

Several factors contributed to extreme fire weather conditions which prevailed over the western States during this fire season. Subnormal winter precipitation was followed by light spring rains and extreme summer drought.

Grasses cured earlier than usual, especially at higher elevations, creating a serious flash-fuel situation. Prolonged periods of above-normal temperatures, accompanied by low humidity, high winds and recurrent "dry" lightning storms combined to create one of the worst fire seasons in many years over vast areas of the West.

### Preparedness and Prevention

As a part of preparedness and prevention, per diem fire guards were assigned to specific areas in advance of the fire season. All equipment and tools were checked and made ready, or replaced where the need was determined, in preparation for a normal fire season.

Emphasis was placed on informing the public of fire danger through ch news media as radio, television, the press, motion pictures, fire osters, fire warning signs, and form letters or notices. In some istricts with high risk areas and histories of man-caused fires, epped-up prevention practices were initiated. These included issue campfire permits, closer supervision of controlled burning, and reproofing of risk areas and highways bordered with flash fuels.

Daily fire-weather forecasts and predicted burning indices enabled lease of more accurate, timely, and effective fire-danger information the public.

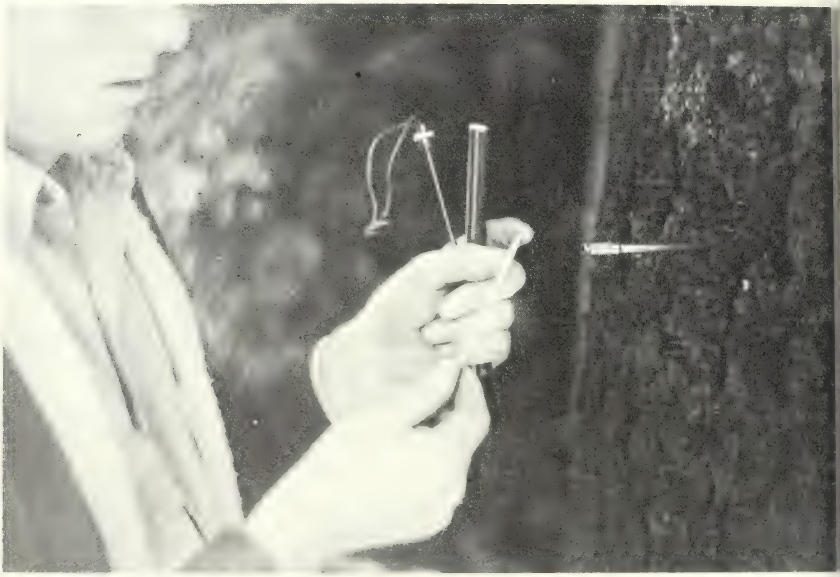
Fire training was increased over previous years. Forty-two rganized fire-training schools were held. Personnel of the Bureau f Land Management concerned with fire suppression received trainng in all districts. School time varied from 2 days to 2 weeks. Also, ersonnel attended 17 cooperative schools conducted by the Forest ervice, State Fire or Forestry Departments, and other agencies. In addition, extensive training was given to Alaskan natives, while ew Mexico and Arizona personnel participated in training Southwest Forest Firefighter Crews. Some districts conducted weekly or eriodic training sessions for emergency firefighters and temporary mployees. Type and intensity of training varied, but the greatest mphasis was placed on fire supervisory and organizational training.

### *uppression*

In 1960, areas burned over included 321,000 acres of Federal land nd 123,000 acres of State and private lands protected by the Bureau f Land Management. Damage to Federal lands was nearly $3 milion, and to State and private lands about $1 million. Over 91,000 man-days were spent fighting fires with a suppression cost of almost 5 million, which included $217,000 from regular funds and $83,000 f cooperative funds.

The fire season was especially critical in Idaho, Montana, and regon. In the 13-day period from July 13 to July 26, 14 fires burned 03,000 acres in these States. Suppression costs on these fires were n excess of $1,200,000. In addition, well over 100 smaller fires urned during the same period throughout the West.

During July and August at the height of the fire season, organized rews were in short supply and in heavy competition with other fireighting agencies for personnel and equipment. During the fire mergency in Montana and Wyoming, all available Southwest Forest irefighters and Montana Indian crews were employed. The National Guard assisted on major fires. While they were not used extensively



*How old is it and how fast did it grow? BLM foresters can tell the age a growth pattern of a tree by using an increment borer. This instrument remov a small round section from the tree. Age can be determined by counting t annual growth rings.*

as firefighters, their services in communications and logistics we invaluable.

Motorized equipment obtained from the military was of considerab value in combating fires. Civilian and military aircraft were in suff cient supply to meet the needs of normal fire situations. Some type particularly air tankers and helicopters, were sometimes difficult t obtain during the peak of the fire season.

One evident weakness in aerial fire control was the lack of goo air-to-air and air-to-ground communications.

## *Situation in Alaska*

The Bureau of Land Management is responsible for fire protectio and suppression on 225 million acres in Alaska. The fire-contr organization in Alaska is too small to meet this enormous respons bility. However, generally favorable fire weather during late 196 resulted in depressed burning conditions. The State experienced onl a moderate fire season. Lightning storms, usually the principal caus of fires in Alaska, were often accompanied by enough precipitatio to prevent fires.

The small force of 17 smokejumpers and aerial retardant attack mbers continued to prove effective in Alaska. During the past 4 ars, helicopters, specialized planes, and smokejumpers have been ed successfully on fires in remote sections of the State.

### ontract Fire Protection

Federal lands under contract protection in Idaho, Montana, eastern regon, and eastern Washington had the most severe fire season in any years. Summer drought coupled with low humidities and high mperatures combined to create an explosive fire situation.

The highly valuable O&C and Coos Bay Wagon lands of western regon experienced a fire season of great severity. In fact, the com-ned summer-fall fire season was the most severe in nearly 20 years.

### ghtning Fires

The number of lightning-caused fires increased from 612 in 1959 to 8 in 1960. Arizona, Idaho, New Mexico, Oregon, and Wyoming d a large increase in fires caused by lightning. Lightning accounted r 49 percent of reportable fires in areas protected by the Bureau of and Management.

On these lands, 51 percent of the fires were man-caused. This em-asizes the need for a vigorous program of public information and ducation.

### rotection and Prevention

Statistics relating to causes of fire emphasize the need for vigorous re prevention.

In view of the critical 1960 fire season, which had an increase of 210 res over the 1956–60 average, early and aggressive action held fire sses well below the 5-year average.

The average number of all fires on lands under jurisdiction of the ureau of Land Management was 1,418 for the 5-year period. The umber of fires in 1960 was 1,628. The 5-year average annual burn as 1.5 million acres. Area burned in 1960 was 350,000 acres or 1.2 illion acres less than the 5-year average. Average dollar value amage for the 5-year period was $4.8 million. Damage in 1960 was 3.1 million or a reduction of $1.6 million.

Statistics indicate that while there was about 14 percent increase n number of fires, there was about 75 percent reduction in area urned and approximately 34 percent decrease in dollar value damage o the national resources.

*A potential public recreation site in the desert of southern California. Classifie by BLM for retention in public ownership and development of recreation resourc this palm lined oasis will offer a cool, quiet retreat for desert travellers.*

## *Rehabilitation of Burned-Over Lands*

A supplemental appropriation of $1,425,000 was used for reforestation and revegetation on burned-over lands. In order to contro runoff, some lands were terraced and dikes, retention dams and debri basins were built. Perennial grasses were seeded on all major burned over areas, and tree seed and seedlings were planted on potentia forest sites in the fall of 1960 and spring of 1961.

## *Insect Control*

Insect infestations are difficult to detect and may be present fo several years before damage is noticeable. They often reach epidemi proportions before adequate control measures are underway. Whil far less spectacular than fire, annual damages by insects far excee that of fire. Last year's severe fire season will promote breeding o many species of insects.

Moderate to severe outbreaks of bark beetle infestations were reported during the past year in Idaho, Wyoming, Nevada, and Cali

ornia. The most serious of these insect attacks was the Black Hills
eetle infestation in Wyoming. An $8,000 appropriation was ob-
ained for control during 1961 and it is expected that at least 2 years
ill be necessary to complete this work.

### *isease Control*

The only known epidemic tree disease affecting timber under juris-
iction of the Bureau of Land Management is the white pine blister
ust, a disease common to all five-needle pines. The principal control
easure is to eradicate the alternate host of the disease, generally
alled ribes. Ribes eradication was carried out on forest lands in
daho and Oregon, where white pine stands make up the major com-
ercial timber. During the 1960 field season, 38,000 ribes plants were
reated and destroyed on approximately 1,350 acres.

### *isease Suppression*

Blister rust control remained a perennial problem. There are two
ossibilities which appear promising at the present time based on
LM studies during the past year. If an antibiotic treatment using
cti-dione proves conclusive, the Bureau will begin using this treat-
ent on a large scale operation next year. The second approach is
tree breeding project.

Rust-resistant tree cones were control pollinated. Cones from these
rees should produce several pounds of seed next year. Eventually
ither rust-resistant trees or antibiotic treatment will eliminate the
resent control system of grubbing or chemically treating ribes plants.
ppropriations for the blister rust control program amounted to
46,900 during fiscal year 1961.

## *Engineering*

A new Division of Engineering was organized by the Bureau of
and Management to provide technical engineering service to land and
esource managers.

Standards will be established for construction of access roads, de-
ention dams, water reservoirs, recreation sites and facilities, and
ther projects. All public land surveys will be completed under this
echnical engineering service, which also prepares maps for adminis-
rative use as well as public land survey plats. Also developed are
ommunications standards, and selection of electronic equipment

## *Public Land Surveys*

The Bureau of Land Management is responsible for all public lan (cadastral) surveys in the United States. This responsibility date back to the 18th century. Cadastral surveys create and establish lan boundaries, identify parcels of land, and furnish descriptions an areas for various subdivisions for title purposes. Cadastral surve boundaries are permanently monumented on the ground and all surveying records are permanently documented in the form of surve field notes and survey maps called "plats." These notes and maps ar available for public use.

The system of rectangular surveys inaugurated by the Continenta Congress in 1785, with some improvements, is the coordinated system of land subdivision used today. It provides for the division of land into townships 6 miles square, each township being subdivided int 36 sections 1 mile square, with boundaries running due north-south and east-west.

Cadastral surveys are often the first step in the development an management of the resources on the national land reserve. On-the ground identification of land boundaries by standard markers aids in the planning of sustained yield programs involving timber an forage resources. These markers facilitate soil and moisture conservation work, as well as the development and lease of mineral resources

## *Resurvey Emphasis*

In 1961, major emphasis was placed on the surveys and resurveys needed for the transfer of school sections to the States—principally in Utah and California, for the adjudication of State selections and exchanges, and for the conduct of public land sales.

Also included in 1961 was the resurvey of public lands on which the original monuments had either disappeared or were in a poor state of preservation.

There remain about 112 million acres of unsurveyed public lands in 11 Western States. Much of this lies within the limits of National Forests, National Parks, Wildlife Refuges, or other permanent reservations, where there is no immediate need to survey the lands. On the other hand, there are extensive unsurveyed areas in Utah, Nevada, Arizona, and California, where the rectangular system of public land surveys should be extended to identify school lands, develop mineral resources, and provide data for administration and development of public lands and resources.

Surveys and resurveys amounting to over 1 million acres in the public land States were officially accepted during the fiscal year 1961.

ield work accomplished during this year was in excess of 3 million
res. Of this total, slightly over 1.3 million acres were of State
lections in Alaska.

### *laska Surveys*

Some 360 million acres of public lands are unsurveyed in Alaska.
ecause of remoteness, climate, and physical characteristics of the
rrain, much of this area will never need to be surveyed.

Surveying in Alaska has been concentrated on those lands selected
y the State under the terms of its Statehood. The new State was
ranted over 103 million acres, with the right to make selections over
25-year period.

To meet these State selection needs, the Bureau of Land Manage-
ent increased its surveying organization in Alaska. Field work
being accelerated to meet a yearly survey requirement goal of 4
illion acres per year. This is the average needed to provide transfer
f the allowable 103 million acres to the State in the stipulated period.

Under the Statehood Act, the Bureau has surveyed only exterior
oundaries of approved selections at intervals averaging 2 miles.

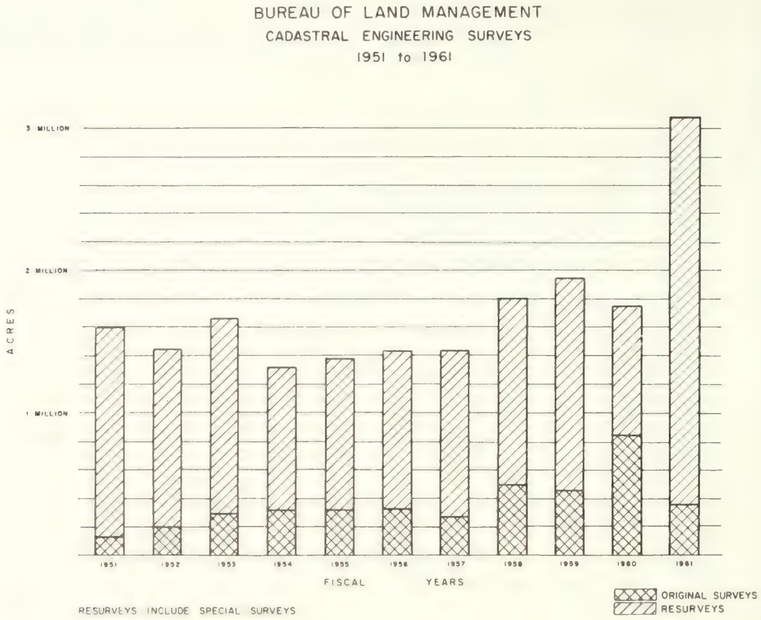
In the expanded program in Alaska, new survey techniques have
een developed and put to use. These involve the use of electronic
istance-measuring devices, photogrammetric procedures, and im-
roved instruments.

### *uter Continental Shelf*

During 1961, in cooperation with the State of Louisiana, work pro-
eeded toward determination of the low-water line of that State in
e Gulf of Mexico.

In order to prepare for increased leasing of submerged lands off
e State of California for exploration and development of phosphate,
leasing map has been completed covering over 92,000 acres. It en-
mpasses a block system of identification and description, based on
ordinates adopted by the State of California. The leasing map
overs an area of the ocean floor some 40 miles west of San Diego, at
he southernmost tip of San Clemente Island, in depths of over 160
athoms.

Considerable progress was also made during the year on the con-
ruction of leasing maps of the submerged offshore areas of northern
alifornia. Four leasing maps of three areas covering 2½ million
cres have been completed.



## *Protraction Surveys*

Two years ago, the Bureau of Land Management initiated survey of unsurveyed areas of public land States by means of protractio diagrams. Protractions follow the rectangular system of public lan surveys on maps, even though the boundaries are not laid out on th ground. This is only a temporary measure designed to serve as basis for descriptions of the lands.

Protraction diagrams are successfully employed as a basis fo mineral leasing and replace complicated metes and bounds descriptions. Protractions also accommodate development of the new system of public land records.

During the year, protraction folios were completed covering approximately 134 million acres in Alaska. Of this total, 76 million acres, diagramed on 268 protraction sheets, were officially approved and made available for oil and gas leasing and other purposes. These protractions are valuable in aiding State selections, and assist in simplifying the surveys necessary to define the exterior boundaries of the State selections.

## *Western Activity*

During the year, some 46 protraction sheets covering 6.7 million acres in Montana, 30 sheets covering 6.5 million acres in Utah, and sheets covering 665,000 acres in New Mexico, have been completed and officially approved. In addition, 14 sheets of protraction surveys covering 1.5 million acres in Nevada were completed. The 14 sheets completed for Nevada mark the beginning of protraction surveys in that State. All unsurveyed areas in Arizona and Montana are now covered by protraction diagrams.

Protractions for Wyoming were introduced near the end of the fiscal year, when a preliminary diagram was submitted to the Bureau of Land Management in Washington for inspection and recommendations.

## *Range Resources*

Management of the Federal rangelands by the Bureau of Land Management has stressed the administration, conservation, protection, development, and balanced use of these Federal lands and resources.

An inventory and evaluation of the Nation's public lands was undertaken, and plans for a separate appraisal of range resources and needs were formulated. Detailed economic studies are under preparation to determine appropriate fees and rental charges for grazing on public lands.

Last year more than 10.8 million cattle, sheep, and horses grazed on the Federal rangelands. This was authorized by more than 19,000 permits for use within grazing districts, and over 9,800 leases for use of other Federal lands. In addition, more than 1.3 million big-game animals made use of rangelands within grazing districts.

### *Range Surveys*

A program of range inventory has been actively pursued, which will provide resource data for management planning and grazing use adjustments. By the end of fiscal year 1961, almost two-thirds of the 161,500,000 acres of Federal range in 59 grazing districts had been completed.

To improve methodology, an analysis of the Bureau's range study methods was completed during the year. As result, a number of refining modifications are being made in range survey and other evaluation procedures.

After making initial management adjustments indicated by range surveys, the Bureau of Land Management began more detailed allotment appraisals. These involve condition, trend, production, utilization, and climatic determinations.

## *Range Condition and Trend Studies*

Comprehensive field surveys of range conditions were conduct annually in the 59 grazing districts. In December 1960, surveys h been completed for about 151,600,000 acres of usable rangeland. On about one-fifth of each district is covered each year with available ma power. In this way, each part of a district is covered once in 5 yea Approximately 6,700,000 acres in grazing districts are unusable f grazing.

For the calendar year 1960, a cumulative summary shows for t respective classes of range conditions the following percentages useable area: excellent 2 percent; good 14 percent; fair 53 percen poor 27 percent, bad 4 percent. Trends in condition of useable ran were as follows: improving 20 percent; indefinite or static 62 percen and declining 18 percent.

*Range condition and trend, 1955 to 1960*

| Year | Usable acreage (thousands) | Range condition class, percent of useable area | | | | | Trends in condition, percen of useable area | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Excellent | Good | Fair | Poor | Bad | Improving | Static or indefinite | Declin ing |
| 1955 | 156,069 | 3.0 | 20.0 | 51.0 | 22.0 | 4.0 | 22.0 | 57.0 | 2 |
| 1956 | 150,835 | 2.1 | 18.0 | 52.0 | 24.8 | 3.1 | 19.7 | 54.1 | 2 |
| 1957 | 149,221 | 2.3 | 17.0 | 53.1 | 24.4 | 3.2 | 22.0 | 55.0 | 2 |
| 1958 | 150,668 | 2.0 | 16.0 | 52.0 | 26.0 | 4.0 | 25.0 | 56.0 | 1 |
| 1959 | 151,930 | 2.0 | 15.0 | 52.0 | 26.0 | 5.0 | 24.0 | 57.0 | 1 |
| 1960 | 151,623 | 2.0 | 14.0 | 53.0 | 27.0 | 4.0 | 20.0 | 62.0 | 1 |

The 1960 data show a continuation of the same undesirable change in range condition and trend that have prevailed generally durin the past 5 years. The current pattern of retrogression, however, i neither universal nor uniform. It is related in part to various stage of depletion occurring prior to the start of mangement and in par to the effectiveness of rehabilitation conducted in later years.

Most of the States reported abnormal and unfavorable climati influences as the principal reason for decline in range conditio Critical deficiencies in precipitation, with consequent scanty forag production and shortage of livestock water have persisted throug three successive years in some States. Rangeland fires, incomplet adjustment of stocking rates, insect and rodent depredation, an expansion of big-game herds are some reasons advanced as contributory causes.

## *Utilization Studies*

On many range areas, checks were made of the degree of grazing use. In some districts, fairly broad areas were inspected. But mos of these examinations were made on seeded tracts, big-game concentration areas involving mainly winter ranges, or on other problem sites.

The tendency of livestock to congregate on seedings often results in overuse, which must be controlled. Game range studies were usually conducted in cooperation with the State game departments. Utilization checks provided a guide to the hunting harvest needed to attain proper objectives of range management.

### *Range Appraisal*

The Senate Committee on Appropriations, in Senate Report No. 94 on H.R. 6345, requested the Secretaries of the Interior and Agriculture to initiate a trial program for public land range appraisal. The Bureau of Land Management and the Forest Service have developed a work plan for conducting the study.

The chief purpose of the public land range appraisal is to obtain current information concerning the condition, production, potential, needed improvements, and a forecast of future long-range management plans for the public lands.

### *Grazing Fee Study*

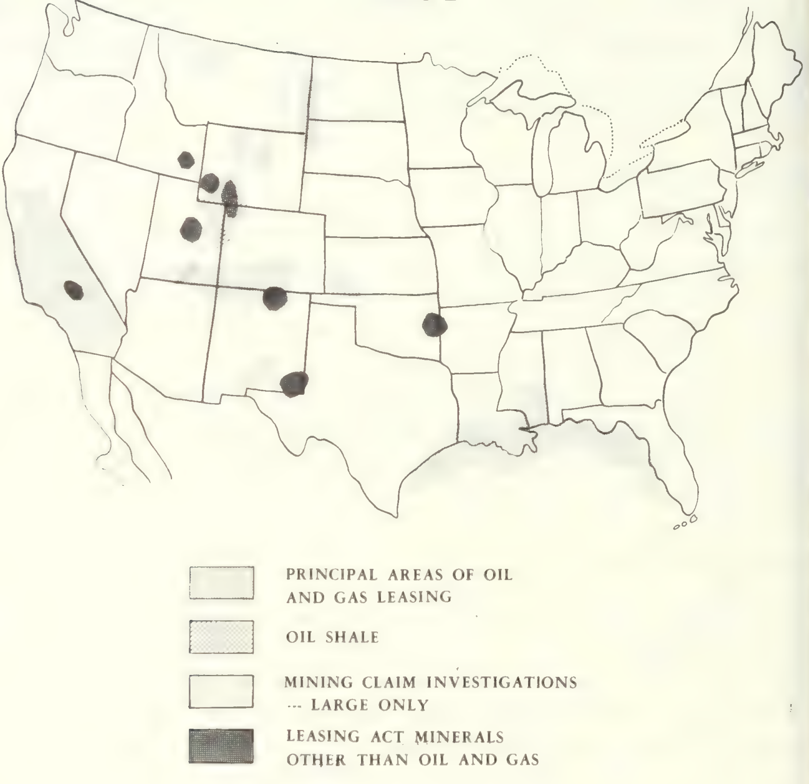
The bureau began a study to determine the effects on ranching operations and land use of grazing fees charged for use of public lands. Involved in this study are a number of influencing factors, including the market value of the grazing resource as shown by pri-ate and State grazing land transactions, and the costs and returns f typical livestock ranches having public-land grazing privileges.

This latter study phase is being conducted jointly by the Economic Research Service, Department of Agriculture, and several State agri-ultural experiment stations under cooperative agreements with the Bureau and the Forest Service. In addition to the effect of grazing ee level on range profits, the influence of grazing privilege adjustments thereon is also being investigated.

### *Range Adjudications*

Completion of the range adjudications continued to receive special mphasis. This activity determines qualification for use of the Fed-ral range, adjusts qualifications to proper season of use and proper ate of stocking, and apportions or allots the available range among hose qualified. Since completion of this activity serves as the basis rom which a sound management program can proceed, its early completion is essential.

## MINERAL ACTIVITY ON FEDERAL LANDS 1961


PRINCIPAL AREAS OF OIL AND GAS LEASING
OIL SHALE
MINING CLAIM INVESTIGATIONS --- LARGE ONLY
LEASING ACT MINERALS OTHER THAN OIL AND GAS

During the 1961 fiscal year 2 percent of the total adjudication jo was completed leaving an uncompleted balance of 39 percent. Accomplishments by States for the fiscal year were as follows:

*Progress in range adjudication for 1961 fiscal year*

| State | Total job—Number of operators | Percent completed 1961 | Percent re maining t be adjudicated |
|---|---|---|---|
| Arizona | 557 | | Complete |
| California | 378 | 0 | [illegible] |
| Colorado | 1,684 | 6 | [illegible] |
| Idaho | 2,433 | 4 | [illegible] |
| Nevada | 1,260 | 0 | [illegible] |
| New Mexico | 4,030 | | Complete |
| Montana | 2,929 | 6 | [illegible] |
| Oregon | 1,097 | 6 | [illegible] |
| Utah | 2,848 | 5 | [illegible] |
| Wyoming | 1,242 | 0 | [illegible] |
| Total | 18,438 | 2 | [illegible] |

## *Conservation and Improvement*

Eradication of undesirable brush was accomplished on 124,786 acres by chemical sprays, chaining, and mechanical brush beaters. Valuable forage species can then be established to increase forage supplies and improve soil stability.

In addition, 228,011 acres were seeded with forage grasses which will improve the quantity and quality of feed supplies for livestock and game.

Other land treatment practices, including pitting, furrowing, and deep tillage, on 15,329 acres increased water absorption and soil moisture and afforded greater protection against wind and water erosion.

During the year, 29 detention dams, 28 diversions, 119,590 linear feet of dikes, and 574 reservoirs were constructed by the Bureau of Land Management.

Protection and management were facilitated by water developments, including 31 wells, 116 spring developments, 311,505 linear feet of pipeline, and 773 miles of fencing.

In range improvements, cooperative efforts and the contribution of $500,000 by stockmen resulted in completion of 856 miles of fencing, 23 wells, 93 spring developments, 93 cattle guards, and 371,418 acres of rodent and predator control.

Additional conservation and improvement measures were completed entirely with funds contributed under authority of section 4 and 15 of the Taylor Grazing Act. This meant an additional 814 miles of fencing, 360,415 feet of pipeline, 84 wells, 50 spring developments, and 49 corrals to the total projects constructed.

## *Weed Control*

Weed control included the investigation of weed infestations, surveys to locate and inventory weed problem areas and their influence on the range, planning of control measures, completing projects and instituting management practices, and cooperative research studies.

To a large extent, this work was concerned with the control of halogeton, a poisonous weed, which accounted for extensive losses among sheep and cattle. More recently, Medusa head rye and host plants for the beet leafhopper have received considerable attention.

The beet leafhopper, carrier of the curly top virus causing severe damage and loss to bean and other agricultural crops, has several annual range weeds as alternate plant hosts. The bean industry is an important part of the agricultural economy of the Snake River

Plains in Idaho. Adjacent lands are primarily annual grass a annual weed ranges of the host plant type.

The lands on which beet leafhopper control work was complet were also lands which, for the most part, were invaded by halogeto and are in the path of the advancing Medusa rye. While efforts a normally directed to the control of specific weed problems, empha toward replacement of these undesirable and low-value plants wi competitive perennial vegetation of high forage value resulted effective control of all weed species and increased range forage.

### *Wildlife Management*

The need for forage resources to maintain an increasing number big game animals was a matter of major concern on rangelands a ministered by the Bureau of Land Management. Cooperation wit other agencies in wildlife propagation and management, and compl tion of technical studies are developing the tools needed for wildli management.

Obtaining a proper balance between the use of the range resourc by wildlife, including 1.3 million big game animals, and domesti livestock continue to prove difficult.

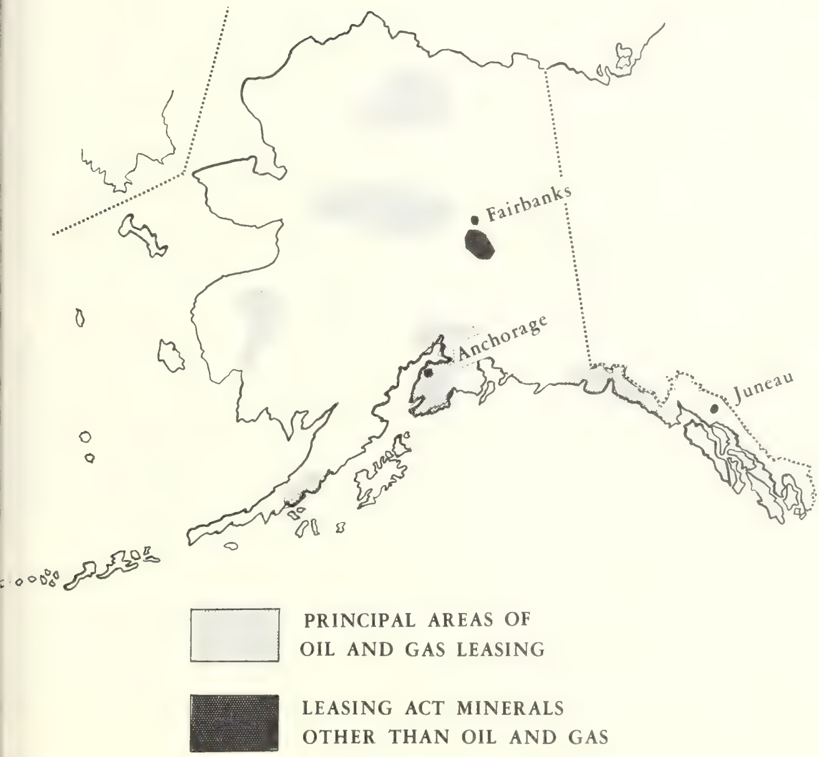
To assist in this work and to provide professional leadership, wild life biologists and game management experts have been added to th staff of the Bureau of Land Management.

## *Mineral Resources*

Conserving the mineral resources in Federal ownership is a majo responsibility of the Bureau of Land Management. This work, par ticularly in the last half of the fiscal year, also involved preparin proposed legislation to meet today's increasingly complex problem of obtaining balanced usage of public land resources.

The Bureau of Land Management is responsible for the management and conservation of minerals on 477 million acres of public lands, on lands in National Forests, military reservations, and other Federal lands; and on lands in which minerals are reserved to the United States. Also administered are mineral resources on the Outer Continental Shelf.

Conservation of minerals is the use of such resources in ways to insure the optimum return to the public, to minimize waste, maximize income, resolve conflicts in land use, and assure adequate reserves for the future.



MINERAL ACTIVITY
ON FEDERAL LANDS
1961

Fairbanks
Anchorage
Juneau
PRINCIPAL AREAS OF OIL AND GAS LEASING
LEASING ACT MINERALS OTHER THAN OIL AND GAS

Other objectives include Federal interest in international affairs, d maintenance of a strong mineral industry.

Receipts from mineral activities constitute a major part of the ome of the Bureau of Land Management. These receipts are many nes greater than expenditures, and a major portion is derived from and gas leasing. On the public lands in the continental United ates, 37½ percent of the leasing income is returned to the States om which the income was received, 52½ percent to the Reclaman Fund, and 10 percent to the general fund. In Alaska 90 percent es to the State. From leasing on the Outer Continental Shelf, all the income goes to the general fund.

An appreciable amount is returned to the States from miner leasing activities on lands of the Bureau of Land Management. I 1961, the amounts (preliminary) were as follows:

| *State* | *Amount* | *State* | *Amou* |
|---|---|---|---|
| Alabama | $865 | Nebraska | $7, 9 |
| Alaska | 3, 555, 417 | Nevada | 193, 5 |
| Arizona | 172, 006 | New Mexico | 8, 090, 7 |
| Arkansas | 48, 384 | North Dakota | 87, 8 |
| California | 2, 942, 415 | Oklahoma | 53, 8 |
| Colorado | 3, 326, 454 | Oregon | 11, 5 |
| Florida | 250 | South Dakota | 45, 76 |
| Idaho | 283, 531 | Utah | 2, 927, 01 |
| Kansas | 154, 847 | Washington | 2, 15 |
| Louisiana | 139, 197 | Wyoming | 13, 019, 77 |
| Michigan | 4, 009 | | |
| Mississippi | 2, 601 | Total | 36, 697, 63 |
| Montana | 1, 627, 422 | | |

The following table shows mineral income for the last 5 years:

| Fiscal year | Minerals income | Outer Continental She income [1] |
|---|---|---|
| 1961 | $116, 926, 549 | $7, 304, 6 |
| 1960 | 324, 018, 287 | 229, 456, 8 |
| 1959 | 95, 877, 021 | 3, 412, 2 |
| 1958 | 94, 769, 021 | 3, 460, 8 |
| 1957 | 83, 396, 655 | 2, 208, 7 |

[1] Does not include $355,796,290 in escrow as of June 30, 1961 pending final action by the Supreme Cou on the Outer Continental Shelf boundary dispute.

Outer Continental Shelf receipts are becoming a significant measur of income. From 1955 through 1961, not including amounts in escrow, the Outer Continental Shelf has produced almost one-half billion dollars, or about one-fifth of the total amount received since 178 from the disposition of public lands and resources.

Total receipts from the Mineral Leasing Act of 1920 are approachin $1 billion, and during the year amounted to $92,329,733. As provide by the Mineral Leasing Act, the States received $36,697,634 as thei share.

*Estimated mineral production from Federal lands (1961)*

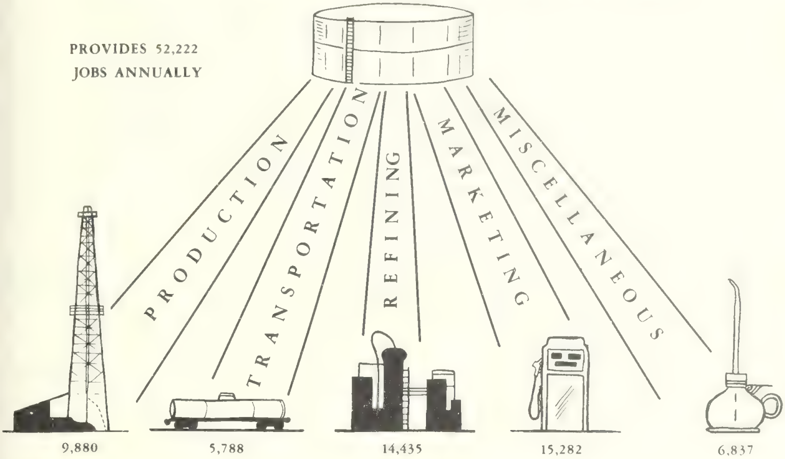
| | Public lands | OCS | Miscellaneous [3] | Total |
|---|---|---|---|---|
| Petroleum, bls.[1] | 160, 526, 000 | 55, 476, 000 | 64, 826, 000 | 280, 828, 00 |
| Natural gas, mcf [2] | 507, 069, 000 | 310, 680, 000 | 157, 251, 000 | 975, 000, 00 |
| Potash, tons | 12, 631, 000 | | | 12, 631, 00 |
| Coal, tons | 5, 400, 000 | | 37, 000 | 5, 437, 00 |
| Sand and gravel, tons | 11, 000 | | 2, 861, 000 | 2, 872, 00 |
| Sodium salts, tons | 1, 037, 000 | 357, 000 | | 1, 394, 00 |
| Phosphate, tons | 1, 185, 000 | | 812, 000 | 2, 057, 00 |
| Sulfur, tons | | 165, 000 | | 165, 00 |

[1] bls.–barrels

[2] mcf–thousand cubic feet

[3] Acquired lands, Naval Petroleum Reserve No. 2, Indian, military and others.

CRUDE OIL PRODUCTION FROM PUBLIC LANDS



| | Production value | Royalty value |
|---|---|---|
| blic lands | $501,093,000 | $62,217,390 |
| ter Continental Shelf | 253,568,000 | 47,555,600 |
| quired lands | 20,592,000 | 2,641,247 |
| litary and other | 9,739,000 | 1,425,769 |
| Total | 784,992,000 | 113,840,006 |

The total oil and gas production value on public lands was about 7 ercent of the total industry output.

In addition there was considerable production of other minerals on npatented mining claims—the amounts of which are unknown.

## *xtent of Activity*

The number of oil and gas leases on public lands decreased to 135,132, overing about 103 million acres on June 30, 1961. The decrease reulted partly from the temporary suspension of leasing—after passage f the Mineral Leasing Act Revision of 1960—until annual rental ates were fixed. A number of "wildcat" leases in Alaska were ropped. On the Outer Continental Shelf, acreage under oil and gas ase decreased to 1,710,951.

A great increase in oil and gas lease activity (167,000 new cases ompared to 119,000 in 1960) resulted from the monthly drawing of ases which expired or were cancelled. The number of minerals adudication cases closed in 1961 was up 40 percent over 1960, to 289,484 ith total unclosed cases on June 30, 1960 amounting to only 57,321 or over 2,000 less than last year. These unclosed cases amounted to on 20 percent of the total closed or roughly 2½ months' work.

## *New Legislation*

A major amendment to the Mineral Leasing Act was the Act of Sep tember 2, 1960, which extended the primary terms of noncompetiti oil and gas leases from 5 to 10 years. Annual rental rates for noncon petitive leases were raised to 50 cents an acre for the entire lease terr This rate is the minimum established by Congress.

New regulations combine the acreage limit for leases and optio from 46,080 acres and 200,000 acres respectively in any one State (e cept Alaska) to 246,080 acres.

Leases presently outstanding, which receive the 5-year extension pr vided by law, are required to pay a rental of 50 cents an acre for eac year of the extended term.

The rental rate for competitive leases prior to discovery was raise from $1 an acre per year to $2 an acre per year. The old rates for no competitive leases had been 25 cents per acre for the first year, nothin for the second and third, and 25 cents for the fourth and fifth year and 50 cents for each succeeding year.

Noncompetitive oil and gas leases are issued for a single term o 10 years. Competitive leases are issued for a single term of 5 years Both leases continue as long as oil and gas is produced in payin quantities.

## *Other Activities*

Activities under Public Law 167 (Act of July 23, 1955), whic authorized the Government to manage the surface on unpatente mining claims, are nearing completion.

Under this law the Federal Government has the right to manag surface resources, including timber and forage, on all unpatente mining claims staked after July 23, 1955. For all claims before tha date, the Government may gain the right to manage the surfac resources under legal procedures provided by law.

This is a conservation measure to prevent mining claims from being staked or used for nonmining purposes, and to prevent timber waste Before the law was passed, neither the Government nor a miner coul legally harvest the timber on an unpatented mining claim.

Legal actions required by law require the Bureau of Land Management to examine areas for any unpatented mining claims. A notice is then published that a determination of surface rights on mining claims will be made. A miner may choose not to respond to the tice—in which case he loses no mineral or mining rights whatso- er, while the Government acquires the right to manage the surface sources. Or he may file a so-called verified statement.

If a miner files a verified statement, validity of a specific claim is termined by the Bureau of Land Management. If it is valid, the overnment will not gain the right to manage the surface. If it is t valid, the Government obtains the right to manage the surface sources. These proceedings are not used to determine validity of a ining claim for patent purposes.

### *caminations Underway*

At the end of the fiscal year, the Bureau of Land Management d completed preliminary examination of approximately 5,600,000 res. About 5,345,000 acres were published. This resulted in the ing of 514 verified statements for 2,558 mining claims. Over 30 rcent, or 2,139 claims, were examined by mineral examiners of the ureau of Land Management.

Determination of surface rights was completed on nearly 90 per- nt of the acreage under preliminary investigation. Of the claims amined, the Government did not acquire the surface management ghts on 582 claims covering 10,842 acres.

In addition to public domain lands, notices were published or re- ests were received to publish notices from the Forest Service on 3,155,000 acres. Verified statements were processed involving 17,- 7 mining claims. Closing decisions, completing the determina- ons of 44,760,000 acres, were issued.

A total of 139 patents to mining claims covering 16,193 acres were sued during the year. The Bureau closed 305 mineral patent pplications cases.

Public Law 359 (Act of August 11, 1955) permitted the location f mining claims on powersite lands. During the fiscal year, 12,457 aims were staked on these lands and recorded in land offices. A ajor decision by the Department, *B. E. Barnaugh*, 67 I.D. 366 1960) held that failure to record a claim will not result in rfeiture.

Public Law 357 (Act of August 11, 1955) permitted mining claims r uranium on public lands classified or known to be valuable for al. It also provided for the extraction of uranium intermingled ith lignite, with the payment of 10 cents per ton for any lignite re- oved. By the end of the fiscal year, 3,206 claims were located on ublic lands (most of which were in South Dakota) and recorded ith the Bureau of Land Management.

### Land Speculation

In California and Arizona, land speculators and promoters pre sented a serious problem, which required aggressive action by th Bureau of Land Management. Promoters located mining claim usually for an unsuspecting client, without a valid discovery and fo purposes other than mining.

A study by the Bureau of Land Management indicated that i southern California, there are more than 2,000 dubious location Administrative steps were taken to examine such claims, and to elimi nate invalid claims. This often resulted in loss of a claim as well a money by the innocent victim of a promoter.

An effort was made to alert the public to such activities of specu lators. In this effort, valuable support was given by local Bette Business Bureaus.

### Outer Continental Shelf Activity

New possibilities developed for use of the Outer Continental Shelf Leasing there was not restricted to oil and gas. Leases were grante in the Gulf of Mexico for salt and sulphur. And interest was show in leasing of phosphorite, 40 miles off the coast of California. Suc activity is the first on the West Coast.

The Solicitor expressed the opinion that the Outer Continenta Shelf Act did not limit leasing to 100 fathom (600 feet) depth, bu rather to the limit of technology. This opinion will result in greatl increased acreage available for leasing in the future.

At the end of the fiscal year, there were 487 active Outer Continenta Shelf leases—covering nearly 2 million acres.

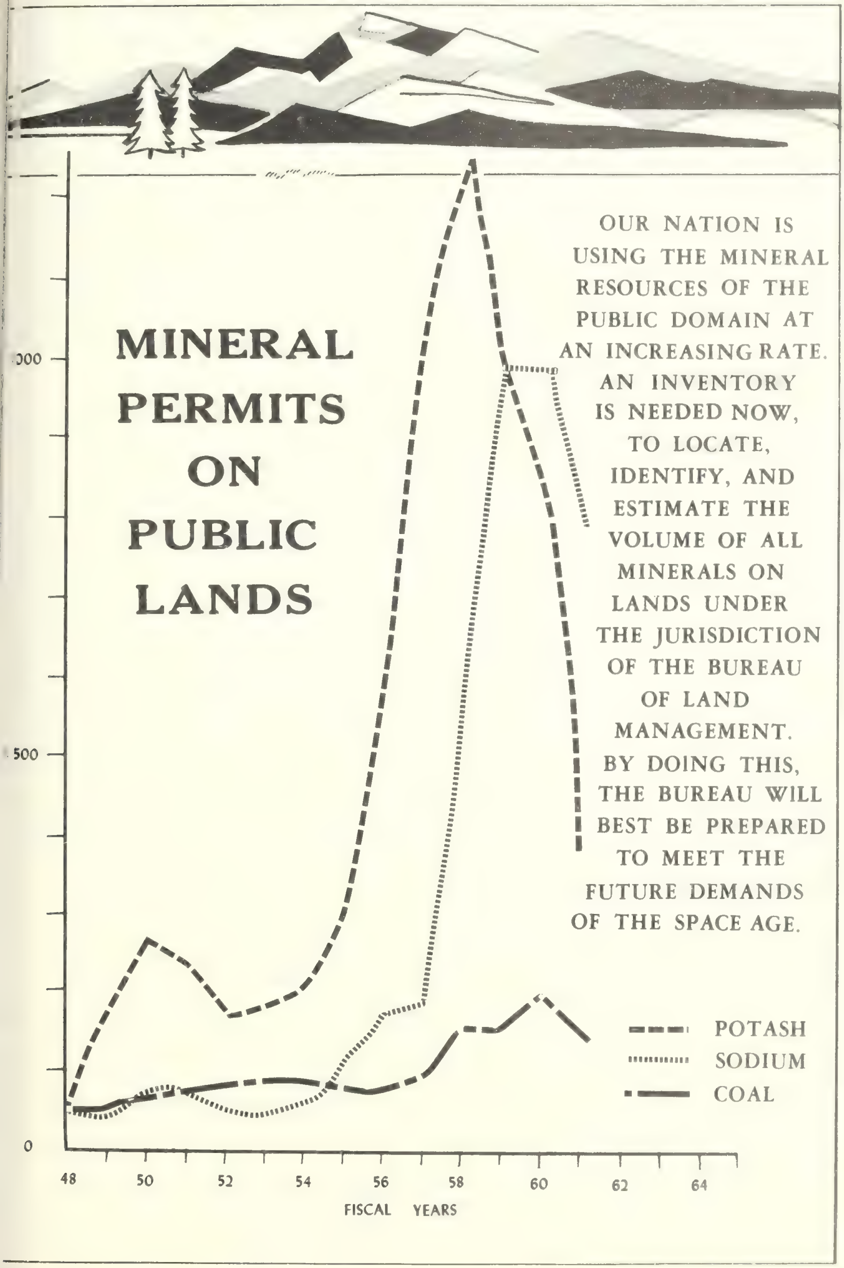
### Plans for the Future

Groundwork in the past year has been laid so that in fiscal yea 1962 an inventory of the national land reserve will be started. Thi resource inventory will aid greatly in the conservation and management of minerals on or in all public lands.

## Eastern States

Remaining public lands in the 13 public land States east of the Mississippi River were administered during the year by the Eastern States Office, now part of the Division of Field Services.

Except in one area in Minnesota, remaining tracts of public domain in these States are scattered and of small acreage.



## MINERAL PERMITS ON PUBLIC LANDS

OUR NATION IS USING THE MINERAL RESOURCES OF THE PUBLIC DOMAIN AT AN INCREASING RATE. AN INVENTORY IS NEEDED NOW, TO LOCATE, IDENTIFY, AND ESTIMATE THE VOLUME OF ALL MINERALS ON LANDS UNDER THE JURISDICTION OF THE BUREAU OF LAND MANAGEMENT. BY DOING THIS, THE BUREAU WILL BEST BE PREPARED TO MEET THE FUTURE DEMANDS OF THE SPACE AGE.

During fiscal year 1961, title to 13,125 acres in these States wa transferred to State and local governments, organizations, and ind viduals. Of this total, 453 acres were sold at public auction; 2,36 acres sold to individuals under the Color of Title Act; 790 acres sol to qualified applicants under the Recreation and Public Purpos Act; 2,983 acres to States in exchange for State lands needed fo Federal land programs; and 6,508 acres in satisfaction of acreag due States under land grant acts.

Receipts from land sales during the year amounted to $70,12 while receipts from both competitive and noncompetitive miner leases and permits on public-domain and acquired lands amoun to $12,252,451.

## *Staffing*

As of June 30, 1961, the Bureau of Land Management had 2,64 permanent employees, 310 of whom were at headquarters in Washing ton, D.C. At that time also, there were 904 seasonal employees

Permanent employees assigned to State and district offices were a follows: Oregon, 550; California, 224; Colorado, 199; Montana, 14 New Mexico, 132; Wyoming, 142; Washington, 30; Arizona, 9 Idaho, 141; Nevada, 132; Utah, 205; and Alaska, 264. Reporting d rectly to the Washington Office were the additional permanent en ployees: 47 with the Records Improvement Project in Montana, with the Outer Continental Shelf Office in Louisiana, 3 with the loca office in Minnesota, and 24 hearings and field committee personn in the various Western States.

## *Finance*

Total appropriations during fiscal year 1961 for operations of th Bureau of Land Management were: Management of lands and re sources, $32,071,000; construction, $350,000; O&C grant land $7,017,594; range improvements, $863,070; and public lands admini tration act, $254,163.

Suppression of fires on timber and grazing lands under the jurisdic tion of the Bureau of Land Management required a supplementa appropriation of $3,700,000. In addition, this was the first fisca year in which a supplemental appropriation of $1,425,000 was re ceived for the immediate rehabilitation of burned-over areas.

In 1961, a new appropriation was established for the work on th O&C grant lands, which is performed with the equivalent of 25 per cent of the total receipts derived from the sale of timber on these land

hese funds are used for the construction, acquisition, and mainte-
ance of access roads, and for reforestation, conservation and recrea-
on purposes.

The appropriation for range improvements is based on 25 percent
the receipts from grazing fees and issued for water development,
ncing, seeding, and other work.

The final appropriation also is a new appropriation in fiscal year
961, and results from the Public Lands Administration Act (P.L.
–649). This appropriation is based on contributions received
nder the Act, and is used for specific projects for which the contri-
ution is made.

### *eceipts*

Gross receipts from the sale and management of public lands and
esources during fiscal year 1961 totaled $159,246,157. These receipts
ame from the following sources: Mineral leases and permits
116,981,971, including $7,304,687 from rents and royalties on the
uter Continental Shelf; timber sales $32,125,757; sales of public
ands $4,250,000; grazing leases, licenses and permits $2,982,188; fees
nd commissions, $2,476,549; rights-of-way, $209,724, and $219,968
rom all other sources.

### *istribution of Receipts*

Receipts of the Bureau of Land Management for fiscal year 1961
ere distributed as follows: $51,935,891 to 27 public land States, of
hich $14,454,673 went to the 18 western Oregon timber land coun-
es; $52,261,699 deposited to the Reclamation Fund; $51,500,444 to
ne General Fund of the Treasury; $3,233,499 transferred to other
overnment agencies; $314,624 earmarked for Indian trust funds;
nd approximately $739,842 returned to the grazing districts for range
nprovements.

Grand total of all receipts of the Bureau of Land Management
nd its predecessor agencies now total $2,423,012,831. Since 1946,
hen the Bureau of Land Management was established receipts now
otal $1,686,367,678.

# National Park Service

### Conrad L. Wirth, *Director*

A New Administration, the half-way point in the Mission 66 program, and inception of the Parks for America movement marked fiscal 1961 for the Department of the Interior's National Park Service

Vigorous words backed by immediate commitments to action launched President Kennedy's approach to America's Recreation Frontier. In his Special Message to Congress on Natural Resources, the President charted a dramatic course to preserve the Nation's rapidly disappearing recreation lands.

He stressed the importance of the National Park System—its contribution to "America's health, morale, and culture . . ." He urged immediate congressional action ". . . leading to the establishment of seashore and shoreline areas such as Cape Cod, Padre Island and Point Reyes." And he instructed the Secretary of the Interior, in cooperation with other conservation groups—public and private—to "formulate a comprehensive Federal recreational lands program."

The sense of urgency conveyed in the President's message has been relayed by Secretary of the Interior Stewart L. Udall to every level of the National Park Service. In an address on March 6, 1961, Secretary Udall stated: "The talk today is of overurbanization, exploding population, and vanishing countryside. . . . We are today in a state of long-term crisis. . . . The overriding mandate to conservationists today is to preserve the natural habitat of man—to preserve it against the onslaught of bulldozers, cement mixers and subdividers."

It is in this context of crisis that we must assess the accomplishments of the National Park Service during the year, that we must evaluate the Mission 66 program—with 5 years gone and 5 to go—that we must take our sights on a future that will challenge our best energies.

## *Accomplishments*

What then, have been the accomplishments this year? Details a related in following sections of this report, but the selected summa below is useful for overall perspective. During fiscal year 1961, t National Park Service:

Provided recreation opportunities for nearly 76 million visit and at the same time preserved the wilderness and natural values the parks. This is the most important single accomplishment of t Service and the System; it is the final measure of all other activiti

Activated five new areas, among them Haleakala in Hawa America's 30th National Park.

Opened 10 new Park visitor centers to the public.

Continued studies of potential local, State, and Federal recreati areas throughout the country.

Initiated public tours of Glenmont, the Thomas A. Edison home.

Tightened motorboat regulations in wilderness areas.

Inaugurated important wildlife management programs and studi

Embarked on a concentrated land-acquisition program for Ci War areas, in line with the Nationwide Centennial Observance.

Improved boundaries of many parks and eliminated key priva inholdings, notably at Mammoth Cave National Park.

Launched the Registered Historical Landmark Program.

Accelerated construction programs to provide relief for ec nomically depressed areas.

Strengthened maintenance functions to assure better preservati and use of park resources.

Encouraged substantial new investments by concessioners to provi better visitor facilities.

Expended or obligated $92 million for 1,147 construction project including new and improved campsites and new visitor centers.

Completed and opened for public use 438 facilities representing a investment of $21 million.

Improved management, protection, and interpretation at parks b adding 1,222 new permanent employees.

Improved the caliber of present employees through training pr grams, such as those conducted at the Service's Training Center i Yosemite National Park.

Underpinning the Service's aspirations for the future was a com prehensive legislative program. Given the need for quick action t save significant open lands, the most important elements of this pr gram were legislative recommendations to create new park, recreation and shoreline areas. Cape Cod, Padre Island, and Point Reyes Na tional Seashores were among those recommended. Other pendin

*anoeing on the Chesapeake and Ohio Canal is a favorite outdoor sport shared by ikers who frequent the towpath throughout the year. The influx of vacationers ho like the great outdoors requires determined efforts by the Park Service to find ore recreation areas in the National Park System.*

ills would authorize, among others, Great Basin and Prairie National arks and Ozark Rivers National Monument.

## *ission 66 Reappraisal*

Mission 66 is a 10-year conservation program for the National Park ystem. Its whole purpose is to make possible the best and wisest se of America's scenic and historic heritage. That means maximum njoyment with maximum protection of those features and those ualities which make it a national park system unmatched in the orld. The purpose has not changed, but the magnitude of the task as. That is why substantial time and energy has been devoted this ear to reappraising Mission 66.

Five years ago, conditioned by the "patch-on-patch" psychology f the war years, park plans seemed overbold. But the vitality, the obility, and the prosperity of this Nation have proved that they ere not bold enough.

In the 5 years just past, hundreds of construction projects ha been completed, a unique system of interpretive centers for park vis tors has mushroomed across the land, camping facilities have be improved, roads have been repaved and relocated.

But instead of the urgency being over, we find ourselves facing new dimension where an action program is required which dwarfs tl first 5 years of Mission 66.

As President Kennedy commented, cooperation between conserv tion agencies and groups must be strengthened at every level. Co servation and wholesome recreation are the elements of one nation problem; the National Parks are not islands unto themselves.

Visitor facilities and existing parks are not enough now, much le for coming generations. By the year 2000 there will be more tha 360 million Americans.

Public response to Mission 66, on the whole, has been overwheln ingly favorable. The American people wanted and got improve facilities in their parks. They appreciated this turn for the bette But there has been concern and criticism, too.

Is Mission 66 overdeveloping the parks? Are the essential valu of the System being compromised in the attempt to provide for th onslaught of visitors? These voices have been listened to. Whe they have been uninformed, every effort has been made to allay fear with facts. Where the voices have offered solid criticism and hav pointed out mistakes, programs have been modified to prevent jeop ardy of lasting values in the parks.

The National Park Service is charged with a single, but twofol purpose: To provide for public enjoyment of the parks in a manne that leaves them unimpaired for future generations. Preservation i combined with use, not alienated from it. The purpose of Mission 6 in its inception and yet today, has been to contain and channel th inundation of people before sheer volume destroyed the basic value of the System. The wilderness character of the System has not bee sacrificed to Mission 66, but saved by it.

Observations indicate that the principal activities of park visitor are camping, hiking to outlying points of interest on park trails nature walks with naturalists, and attending campfire programs an lectures. The vast majority of those who travel to the parks have a good appreciation of what the parks are for and how they shoul be used.

## *Challenge of the Future*

The "quite crisis" of disappearing recreation lands has awakened Americans. They are tired of going to crowded, over-regulated parks.

They want space and they want quite. These are other names for freedom.

Out of the pervasive need for expanded recreation lands a new conservation movement has sprung: Parks for America. It involves he cooperative effort of Federal, State, and local park and recreation gencies.

It is an education in the growing interdependence of our society to ear men and women from these different governmental levels discuss ark and recreation problems. The problems are mutual and they emand mutual solutions. In this realization and the action program t compels lies the challenge and the hope of America's recreation uture.

Parks for America ties together the many strands that make up merica's Recreation Frontier: Mission 66 and a growing, balanced ational Park System; the National Recreation Plan; and State and ocal park and recreation systems.

In concert, the many agencies and governmental levels involved have he chance to save significant portions of man's natural habitat for our hildren's children.

## *Mission 66*

Outstanding as a milestone of the program was the Mission 66 rontiers Conference held in April 1961 in Grand Canyon National ark. Here the park superintendents, representing the grass roots of ark conservation, met with the planners and administrators to take tock of progress made during the first half of the program and to et the stage for the next 5 years. A sober examination of what had een accomplished, an evaluation of successes and failures, and a reedication to the promise of Mission 66 were the main accomplishments f the Conference.

A reappraisal of the objectives as well as the progress of the program as a significant feature of Mission 66 activity during the year. The esult has strengthened our resolution to bring the program to full ccomplishment. Gratifying progress is being made, but it must be peeded up. Increased emphasis must be given to developing a comrehensive program of research to enhance the knowledge needed for ll phases of park protection, interpretation and maintenance. Mangement improvement also needs to be pushed forward at a faster ace. Staffing schedules must be made to keep pace with the provion of physical facilities.

*Preservation and restoration are continued operations of the National Park Servic at Harpers Ferry National Monument as in many other units of the park systen The picture shows Shenandoah Street in Harpers Ferry, a town of outstandin scenic and historic interest.*

Employee training needs to be stepped up all along the line. Bu one of the greatest challenges is the necessary expansion of the National Park System itself.

As a Nation we must provide for the physical, cultural, and spiritual well-being of the people. We must protect and preserve th natural and historical features that represent the greatness of America. The National Park System must be expanded if this is to be don and the growing population is to be provided the open space it needs for refreshment and relaxation. We have learned from the seashor studies that delay in acquiring park and recreation lands means lost opportunities. Remaining areas of natural, scientific, historic, and recreational significance on a national scale must be found and dedicated to the public welfare before they are lost forever.

Providing parks and recreational opportunities for people is not alone a Federal responsibility. An important part of Mission 66 planning consists of developing programs in cooperation with State, county, municipal and other local agencies. Parks for America is being launched as a cooperative program designed to pull together the aims, resources, and skills of all professional park people and citizen groups in a unified plan for a stronger and culturally richer America.

## *Recreation Resource Planning*

Localities, States, the Federal Government together face a crisis n saving space now, and together they must act to set aside national ecreational areas and city playgrounds, State parks and county green belts, and pay a high price for land that will soon be even more costly or else committed to developments. Time and economics no longer vill allow piecemeal action. There must be a pooling of funds and effort by Federal, State, and local governments if park needs now and for the future are to be met.

Accordingly, the National Conference on State Parks, the American Institute of Park Executives and other organizations are cooperating vith the National Park Service in a concerted program to provide adequate Parks for America, an eleventh hour effort to seek authority nd money to bid successfully in the competitive land market while uitable parklands are yet available, and to defend existing parks against encroachment. Secretary Udall has given Parks for America vholehearted endorsement.

### *Nationwide Recreation Planning*

As an integral part of Mission 66, the National Park Service is preparing a nationwide plan for parks, parkways, and recreation areas to be published in 1962, outlining a program that would provide ll segments of our present and future population with adequate outdoor recreation areas near their homes for frequent day and week-nd use, as well as more remote areas for vacation use. In the studies eading to the plan, we are working closely with the President's Outloor Recreation Resources Review Commission.

The report will present a list of specific potential sites as well as ecommended sites for consideration as parks, parkways, and recreaion areas in each of the 50 States, of local, State and National significance. Following publication of the report, the Service expects o cooperate with the States in the preparation of individual State lans.

The inventory of some 5,000 existing local, State and Federal parks nd recreation areas has been completed and approximately 2,400 potential areas have been studied so far. Also preliminary Stat plans have been prepared in cooperation with park and plannin officials of West Virginia, North Carolina, Ohio, Nevada, an Missouri.

## *River Basin and Regional Studies*

The Service cooperated with the United States Study Commission Southeast River Basins, in preparing recreation plans for eight rive basins encompassing parts of Georgia, Alabama, Florida, South Carolina, and North Carolina.

In cooperation with the Corps of Engineers, the Service is als conducting a recreation study of the Potomac River Basin covering parts of Virginia, Maryland, Pennsylvania, and West Virginia. In these river basin studies recreation is a major planning purpose along with water supply, flood control, and pollution abatement.

The Service cooperated with the Department's Bureau of Land Management in the evaluation of the recreational potentialities of certain public domain lands to determine their suitability for administration as park or recreation areas by an appropriate level of government.

## *National Park System Plan*

As a part of Mission 66, work has gone forward on the National Park System Plan to round out the National Park System and insure its future adequacy. Sixty-one areas, totaling more than 3.5 million acres, have been identified as having National Park possibilities, and studies of 10 more are under way.

Of more immediate import, are 11 specific recommendations, many of them supported by bills in Congress, to create new National Park areas. These include Cape Cod, Oregon Dunes, Point Reyes, and Padre Island National Seashores; Chesapeake and Ohio National Historical Park to make adequate the canal property now in National Monument status; and National Historic Site designation for Fort Bowie and Hubbell Trading Post in Arizona, and Old Fort Davis in Texas.

Also included in the recommended legislation is a bill to authorize establishment of Alexander Hamilton's home in New York as a National Monument, and Abraham Lincoln's boyhood home in Indiana as a National Memorial. Buck Island Reef, near St. Croix, Virgin Islands, one of the finest marine gardens in the Caribbean, has been recommended for establishment as a National Monument.

### *Areas Authorized or Established*

Five new units were added to the National Park System during 1961. Arkansas Post National Memorial commemorates white settlement of the lower Mississippi Valley. Russell Cave National Monument, donated by the National Geographic Society, protects an archeological site of 8,000 years of continuous habitation by prehistoric Americans.

Fort Christian, believed to be the oldest standing structure in the United States Virgin Islands, was established at St. Thomas National Historic Site. In addition, the portion of Hawaii National Park on the island of Maui was designated as a separate park—Haleakala—and the Chesapeake and Ohio Canal lands were given National Monument status.

### *Boundary Adjustments*

The boundaries of 10 units of the National Park System were improved by legislation and presidential proclamation during 1961, and action is being considered to make boundary adjustments in 11 other areas.

Encroachments continued to threaten the National Parks during 1961. Mining claims and prospecting beset Mount McKinley National Park, Alaska, Death Valley National Monument, and Grand Canyon National Park, Ariz. A proposed interstate highway would bisect Ocmulgee National Monument.

### *Reservoir Planning and Management*

Twenty-seven recreation reports were prepared for the Department's Bureau of Reclamation and 31 for the Corps of Engineers, and agreements were negotiated with State and local agencies for the management of recreation lands and facilities at 7 Reclamation reservoirs. Forty-two applications for Federal Power Commission permits and licenses were reviewed and recommendations furnished to the Office of the Project Review Coordinator. Increasing emphasis has been given to review of Reclamation reservoir proposals to assure hat current reports and pending legislation provide adequately for recreation lands and facilities.

Assistance was given on 629 occasions in 47 States on a wide variety of problems including interpretative planning on 24 parks in 10 States; additionally, participation from the standpoint of interpretation was given in four training meetings. Included also is planning ssistance to several Indian tribes for developing park and recreation

*The ever-increasing number of visitors to the National Parks and Monuments re quires a constant enlarging of and adding to parking, picnic and campgrounds.*

potentials of their lands to accommodate tourists and vacationers thus strengthening the tribal economies.

Requests for such assistance from the States is expected to rise appreciably in the future because of park expansion programs resulting from increased appropriations and bond issues such as those approved last year in Kentucky, Michigan, and New York, and others being considered in California, New Hampshire, New Jersey, and Pennsylvania.

### *Real Property Disposal*

Recommendations were furnished to General Services Administration on 28 applications submitted by the States and their political subdivisions to acquire Federal surplus real properties for public park, recreation, and historic monument purposes. Of special significance, are the applications of the State of California to acquire as part of the proposed 6,000-acre Golden Gate Headlands State Park on both sides of San Francisco Bay, 291 acres of the historic and scenic Forts Baker and Cronkhite in Marin County. The Service now has compliance responsibility on a total of 205 properties embracing 34,038 acres.

Recommendations also were furnished to the Bureau of Land Management on 62 similar applications to acquire public domain lands for the same purpose.

The 1960 edition of State Parks—Areas, Acreages and Accommodations lists 2,589 State parks, monuments, historic sites, recreation areas and other types of areas included in the State park systems embracing almost 5½ million acres and administered by 99 agencies in the 50 States. The tabulations give for each area the name, location by county, acreage, and the availability of water recreation and overnight and eating accommodations.

State Park Statistics, 1960 reports: (1) attendance of 259 million including 20 million overnight guests, (2) expenditures of $56 million for operation and maintenance and $31 million for land acquisition and improvements, (3) revenue from operations of nearly $23 million, and (4) 7,412 year-round and 10,125 seasonal personnel.

## *Interpretation*

The interpretative program of the National Park Service continued to render an educational service to ever-increasing numbers of visitors to the parks and monuments, as well as to the country's newspapers, magazines, and radio stations.

The program itself was improved by the opening of new visitor centers, which during the year saw a record number of visitors. The latest audio-visual techniques are being developed to make more effective the presentation of the park story in these visitor centers. The interpretative program teaches geology, natural history, history, and archeology to the visitors of the parks and monuments. It contributes substantially to the conservation movement in America. Interpretation becomes a more important phase of the National Park Service's activities and operations from year to year.

### *Visitor Centers*

Visitor center, exhibits, programs, and services for better understanding of the National Parks, have demonstrated their value in helping visitors enjoy the Parks.

Six new visitor centers were opened to the public during the fiscal year, including centers at Everglades National Park, Fla.; Great Smoky Mountains National Park, North Carolina and Tennessee; Mt. McKinley National Park, Alaska; Death Valley National Monu ment, Calif.; Effigy Mounds National Monument, Iowa; and Wrigh Brothers National Memorial, N.C.

### *Service to the Public*

The interpretive program of guided trips and talks offered parl visitors by professional naturalists, historians, and archeologists, supplemented by self-service facilities such as publications, museun exhibits, roadside and trailside exhibits, signs, and markers, anc audiovisual presentations, both indoors and outdoors, was considerabl expanded during the 1961 fiscal year.

A significant increase in personal services is attributable to th filling of 25 new interpretive positions. Eleven park areas, previously without an interpreter on the staff, were enabled to initiat an interpretive program.

Some 49 nonprofit cooperating associations contributed $119,111.0 for aid to the National Park Service for research, equipment, book and materials used in the interpretive program. These association produced 19 new interpretive publications, bringing the total to 190.

### *Roadside and Trailside Interpretation*

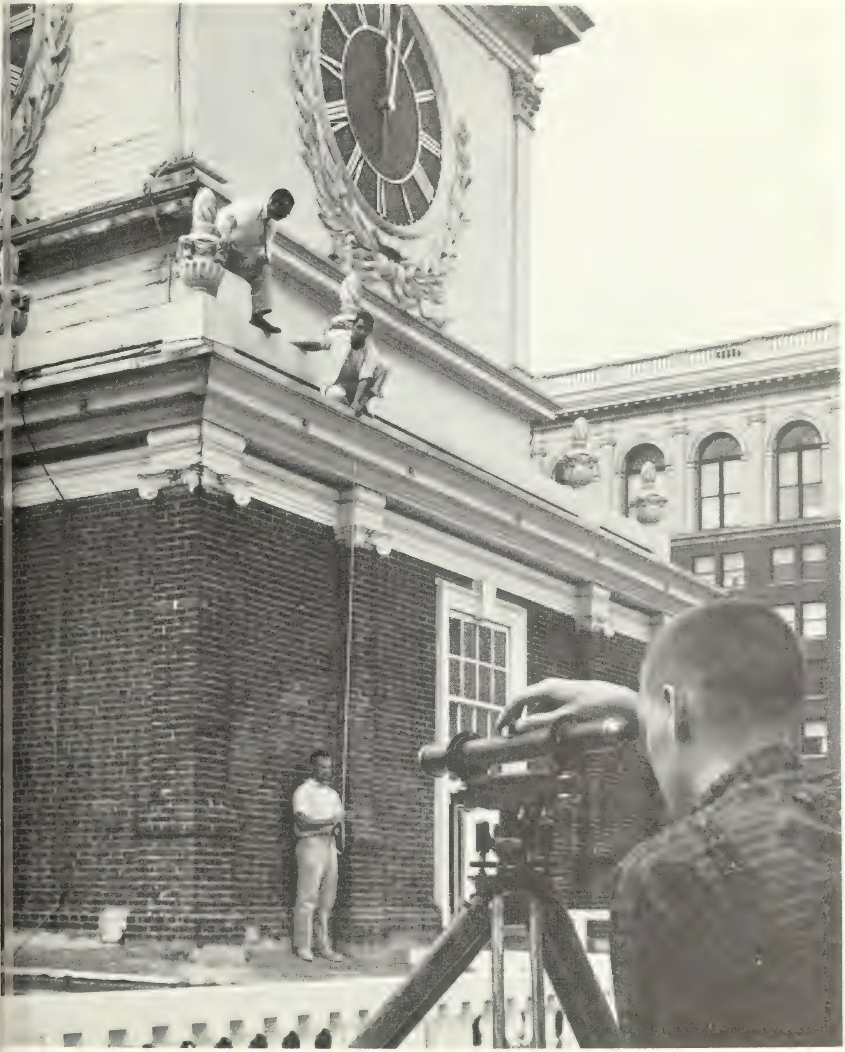
Roadside interpretive exhibits, signs, and markers, and self-guided trails were developed or expanded in many parks during the 1961 fiscal year.

Parks where new roadside or wayside interpretive facilities were installed include Great Smoky Mountains, Everglades, Crater Lake, Mount McKinley, Olympic, Virgin Islands, and Yosemite National Parks; Badlands, Effigy Mounds, George Washington Carver, and Fort Frederica National Monuments; Richmond National Battlefield Park; Blue Ridge Parkway; and in a number of other areas of the National Park System.

An innovation in outdoor interpretation is a self-guided underwater trail at the Virgin Islands National Park, where swimmers follow underwater labels that interpret marine features along the route.

### *Audio-Visual Planning and Installation*

The trend toward greater use of interpretive audio-visual devices continued during the year. Installations were made as follows: Automatic slide/sound equipment in five Park visitor centers; self-contained cabinet slide/sound projectors in four visitor centers; audio-visual equipment for five Park amphitheaters; 18 audio stations in



*onservation, protection, and restoration are important activities in units of the ational Park System. Here summer architectural students employed by the istoric Structures Section of the National Park Service are working high on the t wer of Independence Hall, Independence National Historical Park in Philaelphia, Pa.*

nine Parks; one electric map with automatic recorded message; an utilization of filmstrip in one automatic installation.

Significant in future planning were four custom-built, batter powered audio stations, now providing visitor-activated recorde messages at such diverse spots as an elevated nature trail in the Eve glades, a mountain pass in Coronado overlooking the route followe by Spanish conquistadores, an overlook at Bryce Canyon, and a vie point in Saguaro.

Another of the year's developments which may prove equally sig nificant is the use of motion picture animation techniques to brin "life" to still photographs in the making of motion pictures. Th first sound motion picture production thus made—"The Lincol Country"—is proving vastly more effective than the former slide sound presentation at Lincoln's Birthplace, Kentucky.

### *Museum Program*

Fort Sumter National Monument, S.C., converted a coldly func tional gun emplacement into an attractive museum. Eleven othe parks installed museums in their visitor centers. Fort Frederica Ga., placed weatherproof exhibit cases inconspicuously along th streets of the colonial settlement so visitors could rebuild and repeopl the town in imagination as they explored the site.

Among historic structures carefully refurnished were Officer' Quarters at Fort Laramie National Monument, Wyo., and the Maltes Cross Cabin at Theodore Roosevelt National Memorial Park, N. Dak

Regional offices have established clearing-house safeguards to assur that park collections contain objects important for interpretation, an to eliminate inappropriate specimens.

At Independence Hall National Historical Park in Philadelphia a great eagle painted on the ceiling in Congress Hall has been salvage and will be restored to its honored place. Workmen have also uncovered the original fireplaces in the walls of the building. The ceiling in Congress Hall was collapsing in the chamber that served as the first home of the Senate of the United States. To preserve the intricate and delicate plaster design of the ceiling tracery, photogrammetry techniques were brought into play. Stereoscopic photos were made, which permitted the architectural draftsmen to produce precise drawings of the design. This means of making accurate and detailed drawings opens exciting vistas for the historian, the architect and the administrator.

For example, architectural drawings of a church and steeple which would take a crew an entire summer, with scaffolds and all the paraphernalia such a structure would ordinarily require, can be accomplished with photogrammetry techniques for a portion of the cost and in a fraction of the time. Stereoscopic pictures, with camera locations, angles and distance rigidly controlled, and skilled technicians to compute the measurements with the help of precise mechanical interpreters, tell more of a building's detail than the most careful measurement by traditional methods.

For this reason, photogrammetry is also coming to be used whenever practicable in the Park Service's Historic American Buildings Survey. The H.A.B.S., as the survey is more commonly abbreviated, is a joint undertaking of the Park Service, the American Institute of Architects and the Library of Congress, to enhance the cultural life of the Nation by a comprehensive archive of historic architecture, similar to those already existing in Europe. This past fiscal year saw a gratifying increase in donations and fuller participation by academic and professional organizations. The year's projects contributed more than 300 sheets of measured drawings, 731 photographs and 420 data pages.

### *Natural History*

The interrelationships and ecological requirements of park wildlife received increasing study because a better understanding of these requirements is basic to the fullest interpretation, protection, and utilization by the public, of park values. Some major findings:

On Isle Royale National Park, following many years of severe damage to the forest understory by an overpopulation of moose, a balance has been restored by a number of preying wolves which arrived from Canada.

In Death Valley National Monument, the interrelationship between bighorn sheep, wild burros, and man has been more clearly revealed. It had long been thought that burros which ran wild and multiplied after being turned loose on the desert by prospectors, were driving the native bighorn sheep from their ancestral watering places. This year sheep and burros were found watering together in many areas without conflict; molestation and occupancy of water sources by man proved to be the major factor in depleting the sheep.

### *Research*

Archeological, historical, biological, or geological research was conducted in most of the National Parks and Monuments by Service peronnel, cooperators, collaborators, contractors, or other interested parties.

*The quiet crisis of disappearing recreation lands has finally awakened Americans They are tired of going to crowded, overregulated parks. They want space an they want quiet. These are other names for freedom.*

Archeological research was carried out in 21 National Park Servic areas. Major projects were initiated at Everglades, Yosemite, Sequoia Kings Canyon, Olympic, Whitman, Grand Canyon, Appomattox Cour House, and were continued at Effigy Mounds and at Wetherill Mesa i Mesa Verde.

The service also carried on an extensive archeological salvage program in 35 reservoir areas under cooperative agreements with the Smithsonian Institution and 30 State and local institutions.

Biological research continued on arctic-alpine ecology at Rocky Mountain, Grand Teton, and Mount Rainier. Ecological studies were continued at Sequoia and Joshua Tree. Fisheries studies were conducted at Olympic and Everglades. The Desert Bighorn study at Death Valley was completed, while wildlife studies at Mount McKinley, Grand Teton, Isle Royale, and Acadia were continued.

In cooperation with the Department's Geological Survey, glacial studies at Mount Rainier and Glacier were continued. Additional geologic work was also done at Yellowstone, Wind Cave and Badlands.

Intensive research in all historical areas continued with special projects inaugurated at George Washington Carver and Dinosaur.

### Park Publications

Increased public interest in the National Park System was reflected hroughout the year in a larger than ever demand for publications, factual reports, maps, folders, and reprints of principal addresses by Department and Park Service officials.

Some 11,314,000 free informational publications were produced and nore than 889,482 were sold by the Government Printing Office—yet he demand far exceeded the supply.

As in previous years, handbooks on the historical significance and iatural history of park areas and various reports on the scientific findngs of researchers supplemented the free informational program.

Printing of foreign-language folders in Spanish, German, French, ınd Russian was authorized for Independence National Historical Park in Philadelphia.

### National Survey of Historic Sites and Buildings

The National Survey of Historic Sites and Buildings, as part of he Mission 66 program, completed inventories and studies of sites and uildings in six periods of themes of American history. From these studies, the Advisory Board of National Parks, Historic Sites, Buildngs and Monuments recommended that 94 sites and structures be classified as having exceptional values in illustrating and commemoating the history of the United States under the terms of the Historic Sites Act of 1935.

These classified sites were approved by the Department as eligible of Registered National Historic Landmark status. This new program is an outgrowth of the National Survey. It is designed to recognize and encourage the preservation of sites and structures by State and local agencies, historical societies, and individuals.

Recognition is accorded by the issuance of Landmark certificates and small bronze markers. At the end of the fiscal year, 115 certificates and 11 markers had been prepared. The Department does not bear the expense of restoring or maintaining these Landmarks.

*Cape Cod National Seashore not only has one of the finest beaches in the Unite States but has an endless variety of recreation opportunities in its heath, marsh forests, and lakes. President Kennedy, on authorizing the establishment of th Park, said that he hoped it would be one of a whole series of great seashore park for the use and benefit of all of our people.*

## *Ranger Activities*

Fiscal year 1961 produced 75,756,000 visits to the National Parks a rise of 6 percent over fiscal 1960. This may be compared with th decade 1950–60 average of 6.7 percent annually, during which time th population of the country rose at a yearly rate of 1.8 percent.

Camping continued to overtax facilities and exhibit shifts in patterns. Of the 4,840,000 camper days recorded during calendar 1960. 14 percent were spent under overcapacity circumstances, compared with 15 percent in the previous year. The trend toward trailer camping was evident. Trailer camping in 1960 rose to 26 percent of all camping, compared with 23 percent in 1959.

### *Forest Fire Control*

For the fourth successive year, the number of fires has increased. Subnormal precipitations, dry fuels and other weather factors produced ideal burning conditions, especially in the western parks. There were 540 fires, a substantial increase over the previous 5-year average of 345.

Fire losses amounted to 8,896 acres against the previous 5-year average of 7,109, but this loss is still less than the allowable burn standard of one-tenth of 1 percent of the total area requiring protection from fire. Fire losses in four California national parks contained 87 percent of the total fire damage area. The ratio of man-caused fires to the total number of fires decreased by about 7 percent over the previous year. The safety record of no fatalities or serious injuries was maintained.

The use of aircraft and aircraft-supported operations was expanded over previous years and was instrumental in holding down damages and costs. Fire control personnel had to be rapidly shifted between parks and regions to man some of the larger fires. The Department of Defense cooperated in the fire suppression activities by supplying aircraft when commercial assistance could not be obtained.

### *Insect and Tree Disease Control*

Control operations were expanded to combat outbreaks of bark beetle infestations, particularly in the pine forests in Yosemite, Sequoia, Kings Canyon, Crater Lake, and Grand Teton National Parks. The needleminer which is attacking lodgepole pine in Yosemite National Park has a 2-year life cycle. Direct control to combat the infestations in the moth-egg stage was increased.

The programs for controlling white pine blister rust infections were reoriented. Ecological studies of the rust and the development of an antibiotic permit deferment of control in some parks but requires ntensified control in those parks where standards of control are higher. Actidione, an antibiotic for infections on western white pine, is being used for all control projects where this tree species is present.

### *Wildlife Management*

Reappraisal of wildlife management requirements and programs revealed the need for increased emphasis on ecological investigations, control of overpopulations, and many management oriented activties. Acadia National Park accomplished a desirable deer reduction. An inventory of fish and wildlife management responsibilities in each park was prepared with suggestions for effecting adequate management program staffing.

Range ecology studies at Grand Teton National Park resulted in the formulation of a program for the reduction of elk numbers this fall.

### *Protection Training*

Park Rangers, staff foresters, fire control aids, blister rust worker and other protection technicians received a wide variety of intensi protection training. The numerous facets of ranger activity assig ments require specialized emphasis on such subjects as visitor prote tion, forest and structural fire control, safety for park visitors an park employees, search and rescue techniques, wildlife managemen law enforcement, and mountaineering.

The second water safety and rescue seminar—specializing in boat and boat handling—was conducted at Lake Mead National Recreatio Area for 25 park rangers and 6 other Federal and State employee The National Park Service Training Center at Yosemite Nationa Park graduated 50 Service employees and a Navajo Tribal Park employee. The total number of graduates from the Training Cente during its 4 years of operation is now 203.

## *Operations*

Results of a careful Service-wide reappraisal of the Mission 6 Development Program are reflected in the April 1961 edition of th Control Schedules. This 215-page compendium of actual and projected construction and development cost data is revised annually t reappraise the Mission 66 10-year development program and futur long-range planning.

The latest edition provides a convenient financial summary, by individual parks and construction categories, with summary cost columns to show: (1) costs of the first 5 years of Mission 66 (1957–61); (2) forecast of total Mission 66 costs; (3) annual cost projections for years after 1966 through 1972; (4) 1973 and future years costs; and (5) grand total costs.

In addition to the Mission 66 Control Schedules, a 6-year program of public works projects, in compliance with Bureau of the Budget requirements was prepared. This information covers all areas of the Service, in alphabetical arrangement by State and county locations.

The Branch of Programs has developed procedures for preparing and processing formalized programs for certain activities carried on with annual operating appropriations. The results of this initial activity were utilized in arriving at long-range program goals, as shown in the current edition of the Mission 66 Control Schedules. Further steps in application of programing principles are being worked out and are expected to be put into operation during the next fiscal year.

*aleakala National Park on the island of Maui, 125 miles from Hawaii, was for- erly part of Hawaii National Park but was established as a separate National ark—the 30th—on July 1, 1961. The dormant volcano has a crater 7½ miles long, ½ miles wide, and 21 miles around. The crater floor, 3,000 feet below the ummit, covers an area of 19 square miles.*

## *aintenance*

As a result of a Task Force study, recommendation and subsequent pproval, maintenance activities in the Regional Offices are now on functional rather than a professional basis as heretofore.

In recommending the establishment of a Branch of Maintenance each Regional Office, the Task Force stated that a functional type rganization would pinpoint responsibility and thus the needed im- etus would be provided to systematically and continuously assist e parks in planning, developing, and carrying out the type of overall aintenance program required to protect the Government's investment d adequately serve the needs of the visitor.

Staffing levels commensurate with the workload in each Region have en established and action has been taken to realign personnel to eet requirements.

## *Concessions Activity*

Thirteen concessions authorizations were negotiated, six of whic have been executed on behalf of the Government. Eight of tho negotiated included construction programs, with investments totalin approximately $10,228,000. These will result in new and improve facilities at Lake Mead, Shenandoah, Glen Canyon, Big Bend, Mammoth Cave, Isle Royale, Olympic, Yosemite, Petrified Forest, an Blue Ridge Parkway.

Four prospectuses were issued soliciting offers for facilities Haleakala, Fort Sumter, Lake Mead, and Rocky Mountain. Fiv offers were received as a result of the Fort Sumter prospectus, but non resulted from the one issued for Haleakala. The Lake Mead an Rocky Mountain ones are still outstanding.

Virginia Peaks of Otter, Inc., completed restaurants and servic stations at Whetstone Ridge and Otter Creek in Blue Ridge costin about $200,000; Yosemite Park and Curry Company spent abou $500,000 in improvements in Yosemite; Fred Harvey completed nev facilities on the South Rim of Grand Canyon costing about $160,600 and Virginia Sky-Line Company invested nearly $377,000 in nev facilities in Shenandoah. Concessioners also completed improvements at Glacier, Grand Teton, Hawaii, Lake Mead, Lassen, Nationa Capital Parks, Rocky Mountain, and Yellowstone, totaling approximately $536,355.

## *Other Activities*

The House Interior and Insular Affairs Committee issued a statement confirming the concessions policies of the Service, and furthe resolved that the policy of granting a preferential opportunity t existing concessioners to negotiate a new contract, if service has bee satisfactory during the life of their expiring contracts, shall be interpreted to apply to nonprofit distributing organizations.

## *Land Acquisition*

Appropriations for the purchase of lands during fiscal year 1961 totaled $2,475,000, allocated as follows: $400,000, Civil War areas; $500,000, Minute Man National Historical Park; $250,000, Independence National Historical Park; $540,000, Mammoth Cave National Park; $275,000, Castillo de San Marcos National Monument; $100,000, Petrified Forest National Monument; and $410,000 in other areas of the National Park System. Some 26,450 acres were acquired by purchase, donation, transfer, or exchange, of which 2,440 acres were donated.

*urnside Bridge at Antietam National Battlefield Site is of both scenic and historic terest and illustrates the Service's dedication to the conservation of the scenic, ientific, and historic heritage of the United States for the benefit and inspiration its people.*

Completed purchases and accepted options cover 2,830 acres of land Glacier, Mammoth Cave, Rocky Mountain, and Yosemite National arks; Badlands, Black Canyon of the Gunnison, Capitol Reef, Casllo de San Marcos, Joshua Tree, and Petrified Forest National onuments; Gettysburg National Military Park; Manassas National attlefield Park; Fort Clatsop National Memorial; and Gloria Dei ational Historic Site.

The purchases of the Great Onyx and Crystal Caves in Mammoth ave National Park were the most significant acquisitions during the ar.

## *ater Resources and Water Rights*

The Department approved, with the concurrence of the Secretary Agriculture, the application of the city and county of San Fransco under the Raker Act of 1913 for a change in a right-of-way ation at the Hetch Hetchy project, Yosemite National Park and anislaus National Forest. The change, as approved, will permit a tunnel to be constructed between O'Shaughnessy Dam and Early Intake on the north side of the Tuolumne River under appropriate stipulations regarding the release of water to the stream for preservatio of fish life and esthetic values.

A major problem has arisen in southern Florida involving th Everglades National Park as a result of the planning and development of the southern Florida flood control project of the Corps o Engineers. It will be imperative to provide a systematic release o water to the park to preserve its natural conditions. Preliminar discussions with the Corps of Engineers to achieve the desired result were started this past year.

## *Design and Construction*

At the outset of fiscal year 1961, more than $106 million was available for 1,365 projects for the construction programs of the Nationa Park Service, including balances from preceding years. This increased to 1,559 projects at more than $108 million. By June 3 more than 88 percent of these funds were obligated and contract for 719 projects totaling more than $71 million were active. Fou hundred and thirty-eight projects totaling more than $21 million were completed. With the expanded construction programs 24 contracts for professional and engineering services were consummated.

### *Roads and Trails*

There were 125 miles of major road projects under construction a a cost of $11,847,975 for 28 projects. Fourteen projects covering over 52 miles of reconstruction and about one-half mile of new construction were completed at a cost of $4,407,437. Also 17 projects totaling 139 miles of reconstruction and 7 miles of new construction were placed under contract at a cost of $7,716,625. Eleven miles of the reconstruction were completed.

Completions included reconstruction of the Jackson Lake Road at Grand Teton, the Bear Lake Cutoff at Rocky Mountain, three bridges at Yellowstone, the East Rim Drive at Grand Canyon, two bridges at Mount McKinley, a portion of the Newfound Gap at Great Smoky Mountains, the Cape Royal Road at Grand Canyon, the Nisqually River Bridge at Mount Rainier, and paving of the Tioga Road at Yosemite.

Larger projects placed under contract were the New Fremont River Road at Capital Reef, reconstruction of the Chief Mountain Road at Glacier, a portion of the park road at Mount McKinley, by-

*he National Park Service is increasing the number of visitor centers where udiovisual programs—employing improved electronic equipment—supplement ersonal services to explain the natural or historic aspects of the park or monument the visitors.*

ass road at Hawaii, Walnut Canyon Road at Carlsbad, and the final ortion of the Newfound Gap Road at Great Smoky Mountains. he Cape Royal Road at Grand Canyon, the Two-Medicine Road at lacier, and the Arnica Creek-Bridge Bay portion of the Grand oop at Yellowstone, were completed.

Projects involving 164 minor roads and trails in 63 parks totaling ore than $6,800,000 were completed. Among these were rehabili- tion of tour roads in Saratoga; walks, trails, and parking area at ammoth Cave; the Painted Desert Road system in Petrified Forest; nd the road system in the Grand development, Yellowstone. Park- g space and campground facilities were significantly increased.

A large number of projects were completed on the motor roads and adjoining recreational areas. The completions on roads repre- nted 20 major contracts costing approximately $8,800,000, including miles of paving, 46 miles of surface treatment, 30 miles of grading d base course work, and 20 bridges and grade separations. A 14- ile section of the Blue Ridge was opened near Roanoke and except r a missing link of 15 miles, it is complete in Virginia. In North

Carolina, 12 miles of paving was completed and except for 5½ mil travel is continuous for 96 miles from the State line to Asheville. new 13-mile section was opened where the Parkway soars to a climacti four State view at an elevation of 5,820 feet.

## *Parkways*

The National Parkways construction program was concentrated o additional visitor facilities and the provision of continuous trave The $16 million contract authorization provided the following: Blu Ridge Parkway $4,058,300, Natchez Trace Parkway $4,574,000, Foothills Parkway $3,075,200, Colonial Parkway $20,400, George Washington Memorial Parkway $3,537,500, Baltimore-Washingto Parkway $359,200, Palisades Parkway $175,000, and advance planning $200,000.

On the Natchez Trace remaining grading and several major bridge were completed on the 165-mile unit between Jackson and Tupelo 112 miles were paved. Public service features completed on the Blu Ridge and Natchez Trace included picnic grounds, campground road trails, comfort stations, and utility systems.

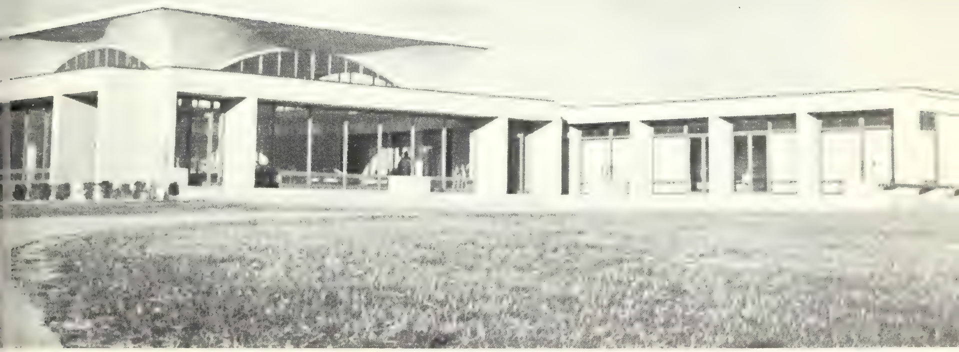
On June 30, there were 33 major contracts totaling approximatel $24,700,000 in process under the Bureau of Public Roads major road program, including 75 miles of final paving, 66 miles of grading an base course work, 23 bridges and grade separations, 8 tunnels, an other road work. About $10 million worth of construction is on th Blue Ridge, $5,800,000 on Natchez Trace, and $6,700,000 on Georg Washington Memorial Parkway.

Advisory services provided jointly by the Bureau of Public Road and the Service were started in Tennessee on the Great River Road This will be a mile-to-mile location and boundary report which will allow the Mississippi River States to proceed with lands and acces control for protection of the Parkway corridor.

## *Buildings*

Visitor centers were completed at Everglades (where $33,000 was spent to repair damage by Hurricane Donna), Devils Tower, Petrified Forest, and Fort Vancouver; four are under construction. Also completed were a Sports Center at Rock Creek and Potomac Parkway. One dormitory and 46 permanent and 33 seasonal Park residences were completed. An additional 44 residences are under construction.

A $3,796,000 contract was awarded at Jefferson National Expansion



*he National Park Service opened 10 new visitor centers to the public during the
udget year. Like this one at Wright Brothers National Memorial in North Caro-
na, they are equipped with audio-visual and other display material to make the
esentation of the park story more effective and attractive to the ever-increasing
umber of visitors.*

emorial for the building of the grand steps and side steps to the
erlook structures, foundations for the Gateway Arch and Visitor
enter, and relocation of Levee Street and the railroad tracks east
the Memorial. Including Federal, city, and Terminal Railroad
unds, $23 million has been authorized for the Memorial. It is
heduled for completion in 1964.

### *tilities and Miscellaneous Structures*

The Service continued its expansion of public use facilities and
scellaneous structures; such as sand stabilization at Cape Hatteras;
edging lagoon at Bridge Bay, Yellowstone; and grounds improve-
ent at Independence. A total of 146 projects in 115 parks totaling
ore than $3 million were completed. Also 92 water and sewer proj-
s in 74 parks, totaling over $5 million were completed, notably the

water and sewer system in Grand Canyon, which included a 3 millior gallon water storage facility; a new water supply system at Petrifie Forest; and additional utilities in Yellowstone totaling more tha $500,000.

Sixteen power or communication projects in 23 parks were com pleted. Outstanding were the leased two-way radio systems a Natchez Trace at a cost of $525,000, a similar system at Blue Ridg $452,000, and another at St. Johns, Virgin Islands, $47,000.

### *Master Plans*

In keeping with the Service's objective of providing at least som visitor use facilities in parks immediately after establishment, goo progress has been made toward the development of Master Plans fo new parks. Construction of facilities in conformance with the Maste Plans has already been started or scheduled in Horseshoe Bend, Pe Ridge, Wilsons Creek, Russell Cave, Flaming Gorge, and Glen Canyor

## *National Capital Parks*

National Capital Park facilities in fiscal 1961 were used by ar estimated total of nearly 141 million persons. Of this figure, mor than 5¼ million were counted at the five major memorials. Ther were 366 special events.

A new C&O Canal barge, more authentic historically, with improve public address system and passenger comforts, replaced the old barg in May. Visitor hours at the Washington Monument and Lincoln Memorial were extended. In its first year of operation, 125,000 participants used the Rock Creek Nature Center, overtaxing facilities ir May, June, and October.

Operation of the 194-man United States Park Police force helpe to cut traffic accidents and crime incidence. New uniforms, high visibility outer-garments for traffic control, an up-to-date "mobil relay" radio system, and intensive training all contributed to the improvements.

With the worst winter in two decades, National Capital Parks used 4,600 tons of sand, 79 tons of calcium chloride, and incurred the expense of $100,000 for patching potholes in park roads caused by freezing and thawing. Research continues on Dutch elm tree diseases and turf improvement. Propagation of plants included 18,000 at nurseries and greenhouses and 3,900 waterlilies and lotuses at Kenilworth. Some 60,000 plants were used in display beds.

*rowds of interested visitors to Harpers Ferry National Monument gather around park historian for information and guidance—typical of visitor activity in most f the historic sites and battlefields being administered by the National Park ervice.*

## *Mission 66 Improvements*

Noteworthy among these were the Harry T. Thompson Boat Center, econstruction of Bingham Drive in Rock Creek Park, improvements o Pulaski Park, new tennis courts in East Potomac Park, exterior ainting of Executive Mansion, campfire circle at Catoctin, and a re house at Prince William Forest Park.

Contract work for fiscal 1961 shows: 21 contracts completed at a ost of $1,172,151; 11 contracts in progress at a cost of $2,795,945; nd 16 contracts to be awarded before June 30 at an estimated cost f $1,507,540, for a grand total of $5,475,636.

Important planning work in progress includes the Park Operations uilding, restoration of Ford's Theater, and development of Greenbelt ark.

*Pottawatomie County in northeastern Kansas is the location of a proposed Prair National Park—a plan to conserve a sizable representative section of the prair as nearly as possible in its original condition.*

## *Planning and Land Acquisition*

Legislation was introduced for (1) acquiring 790 acres at Gre Falls, Va., now on a 50-year lease; (2) acquiring Mockley Point are opposite Mount Vernon; (3) extending George Washington Memori Parkway from Mount Vernon to Woodlawn; and (4) establishing Board to screen proposed memorials in National Capital Parks area Added to park lands were 388.63 acres valued at $1,188,512. Lost b transfer or sale were 5.03 acres assessed at $511,591.

## *Budget and Finance*

The Service's financial position was further strengthened throug appropriation increases for the 1961 fiscal year. There follows a com parison of the 1961 appropriations with those for 1960:

INSTRUCTIONS
FOR
REGISTERING
WHEN YOU ARRIVE
-TAKE A REGISTRATION CARD
-SELECT A CAMPSITE
-FILL OUT CARD-PRINT PLAINLY
-DETACH "OCCUPIED BY" STUB AND
PLACE IN CARD HOLDER ON MAP
AT YOUR CAMPSITE NUMBER
-PLACE CARD IN BOX AT RIGHT
WHEN YOU LEAVE
REMOVE YOUR "OCCUPIED BY" STUB FROM
MAP AND PLACE IN BOX AT RIGHT
REGISTRATION STATION

*ampers at the Elkmont Campground in the Great Smokies pick their own spot nd register by inserting an "occupied by" card in the proper card holder on the ig board. On leaving the campers remove their card and the board once again ows a "vacancy."*

| *Appropriation item* | *1960 Fiscal year* | *1961 Fiscal year* | *Increase* |
|---|---|---|---|
| Ianagement and protection | $16, 772, 000 | $20, 509, 000 | $3, 737, 000 |
| Iaintenance and rehabilitation of physical facilities | 14, 435, 000 | 15, 800, 000 | 1, 365, 000 |
| eneral administrative expenses | 1, 475, 000 | 1, 581, 000 | 106, 000 |
| onstruction | 16, 735, 000 | 21, 528, 000 | 4, 793, 000 |
| onstruction (liquidation of contract authorization) | 30, 000, 000 | 30, 000, 000 | ---------- |
| Total cash appropriations | 79, 417, 000 | 89, 418, 000 | 10, 001, 000 |
| onstruction (amount by which roads and trails and parkways contract authorization exceeds cash appropriation) | 6, 000, 000 | 4, 000, 000 | −2, 000, 000 |
| Total new obligational authority | 85, 417, 000 | 93, 418, 000 | 8, 001, 000 |

Of the total increases reflected in the foregoing, $1,576,000 was for ncreased salary costs as authorized by Public Laws 85–584 and 86-68; $1,079,000 was required to meet unusual emergency costs incident o forest fire suppressions, building fire losses, and storm damages; nd $2,953,000 for construction at Jefferson National Expansion Memorial. The remainder, $4,393,000, was for strengthening the arious Service programs, including Mission 66 development.

### *Audit Activity*

Substantial progress was made during this fiscal year in achieving the desired 3-year audit cycle for approximately 200 concessioners 208 area and field finance offices, and 48 natural history and history associations cooperating with and rendering aid to the National Park Service. Approximately 50 percent of the field finance offices, 2 percent of the areas and concessioners, and 30 percent of the cooperating associations were audited during the fiscal year. In addition special financial examinations were conducted covering prospective concessioners, an electric power company, and certain entrance station activities.

# *Office of Territories*

### Richard F. Taitano, *Director*

Fiscal 1961 saw a continued rise in political, social and economic progress in the territories. The Legislature of American Samoa convened for the first time as a law-making body, as provided in the first Constitution of American Samoa adopted in April 1960. The Virgin Islands Legislature met in a session outstanding in mutual cooperation and understanding and adopted many enactments of importance to the slands, among them a new civil rights act.

In the Trust Territory of the Pacific Islands, the sense of solidarity among the peoples of the islands was strengthened through the annual conference of the Inter-District Advisory Committee to the High Commissioner, representing Micronesian delegates from all districts and envisioned as the future legislative organ of the Territory.

Legislation is pending in the Congress to provide Guam and the Virgin Islands with nonvoting representation in the United States House of Representatives. Representatives from the Department of the Interior and the territories strongly recommended enactment of the legislation.

American Samoa, the Virgin Islands and Guam this year for the first time have been included in certain Federal aid programs, such as the recently enacted Area Redevelopment Act and the Federal aid to public schools bill passed by the Senate.

## *American Samoa*

Political development continues to play an important role in American Samoa. With the approval and promulgation of the first

Constitution of American Samoa on April 27, 1960, the territory awaited with anticipation the opening of the Seventh Legislature of American Samoa on March 13, 1961, the first held under the new Constitution. The opening session was attended by traditional leaders and Government officials and the tone of the whole session complemented the remarks of the Secretary of the Interior that the Legislature's record will greatly influence the rate and extent of the future development of self-government and self-determination.

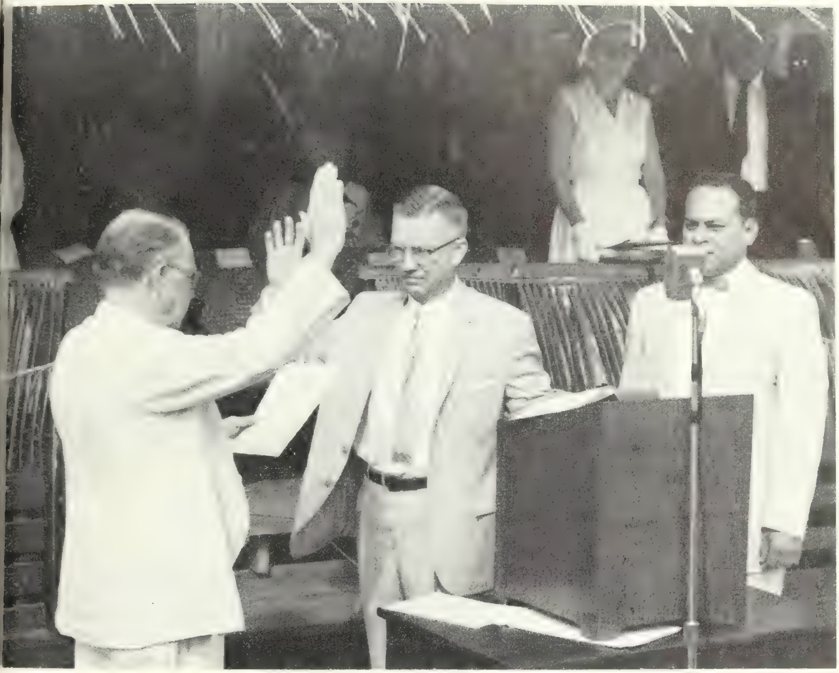
The first bill signed by the Governor on April 3, 1961, under the new Constitution created a sports commission. Subsequent acts abolished the Government cooperative, revised the appellate court system, provided for regulation of professional surveyors, repealed Chapter 32 of the Code of American Samoa, provided for the sale of the Bank, prescribed penalties for the deposit of materials on public highways, and provided for payment of compensation to legislative members.

### *Conference Preparations*

Among the major assignments facing the new administration was the preparation for the South Pacific Conference in American Samoa in July 1962. Since this is the first time the conference, which is scheduled every 3 years, will be held on American soil, international interest will be focused on the policies and programs in American Samoa.

Realizing the conference will be a major challenge and an unparalleled opportunity, the Government began early to consider its requirements. A South Pacific Conference Planning Committee, consisting of Samoans and local Government employees, was appointed to coordinate the needs of the conference for necessary landscaping, catering and housekeeping, public relations, and entertainment arrangements.

Construction of adequate housing facilities for the expected 200 delegates was the first major project to be instituted. Work was begun in February on the construction of two new buildings at Utulei with early schedules being met. Construction is in accordance with the Government's 6-year plan for developing school facilities and at the termination of the conference, the buildings will be reconverted to original design for high school expansion. Airport construction continued to receive emphasis during the fiscal year. Insufficient equipment and breakdowns plagued the construction of the proposed 9,000-foot runway but work in general was accelerated. The objective is now a minimum operating airport facility by June 1962 with final completion scheduled for early 1963.



*Chief Judge Arthur A. Morrow administering the oath of office to Governor H. Rex Lee on May 27, 1961, in a public ceremony held in the village of Fagatogo, American Samoa. Former Governor Peter Tali Coleman is shown at the right.*

### *Senate Unit*

A special Senate Study Group arrived in American Samoa in December 1960 to conduct a study and investigation of conditions in the territory to determine economic improvement and provide a greater amount of self-government. Emphasis on the responsibility of the United States in the South Pacific and in the forthcoming conference was further evidenced by the Study Group in proposing a more active role in the development of Samoa in the American tradition without a sacrifice of the native culture.

As a means of training Samoans in the art of long line fishing, the local tuna company purchased a fishing vessel in Japan for this purpose. The acquisition of this vessel will add to the skills of the men of the territory, provide additional employment opportunities, and help raise the standard of living in Samoa.

A change in the Social Security Act as authorized by Public Law 86–77 extended coverage to American Samoa effective January 1, 1961. All employees of the Government and its instrumentalities, exclusive of those persons contributing to the Federal Retirement system, were

*Group of Micronesian students attending college in Guam.*

included in the program on a compulsory basis, and for the first time applicants in the southern hemisphere have been issued Social Security cards and provided Government workers with an important extension of benefits.

These major political, economic, and social changes during the fiscal year contributed in great measure to territorial development and the Government closed the year's operations confident that with the increased interest on the national and international levels in the South Pacific and in Samoa, subsequent changes would continue to be for the betterment of the Samoan people and their way of life.

## *Guam*

The growth of political awareness in Guam was reflected in the November general election for members of the Sixth Guam Legislature and the Municipal Commissioners. Of 14,183 eligible, 11,922 persons registered to vote. Eighty-nine percent of the registrants cast ballots in the election.

The Legislature of Guam during the year enacted a number of measures to provide for the people of Guam improved services in education, health, public welfare and other fields.

Reorganization of the executive branch during the year included consolidation of the Office of Civil Defense under the Department of Public Safety; transfer of the Division of Public Welfare from the Department of Finance to the Department of Medical Services; abolishment of the position of Director of the Budget and the con-

*New Asan Point Public Health Center is one of four completed in Guam in the fiscal year 1961.*

solidation of this office with the Department of Finance; transfer of the Alcoholic Beverage Control Administration to the Department of Finance; consolidation of the Public Utility Agency with the Department of Public Works; and transfer of the responsibility for the maintenance of parks from the Department of Land Management to the Department of Public Works.

Enrollment in the public schools increased to approximately 13,500 pupils. The College of Guam, which is accredited by the Western College Association as a Junior College, was authorized to expand to a four-year college.

## *Capital Improvements*

Work accomplished on capital improvement projects by the Department of Public Works represented a total expenditure of approximately $1,650,000. Major projects completed during the year included the construction of the Agat Junior High School, with a student capacity of 1,000, and the Andersen Elementary School, with a 14-classroom extension. The second increment of the new Administra-

*Fort Apugan, an old Spanish Fort on Guam which was restored this year, showing the new road leading into it and Agana in the background.*

tion Building, a two-story reinforced concrete structure, was completed and occupied.

Final plans were completed for the Agana Urban Region. This planning was partly financed through an Urban Planning Grant from the Housing and Home Finance Agency. Development was started on four park areas and one beach for recreational purposes. Four new Public Health Centers were opened for service.

During the fiscal year, 13 local residents were appointed to key positions in the Government formerly held by off-island contract employees. Since the advent of the new administration two local residents were appointed by the Governor as department heads.

## *Commercial Activity*

The Commercial Port of Guam handled 175,658 revenue tons of cargo, consisting of 107,143 revenue tons of imports valued at $24,667,984.88; 48,045 revenue tons of exported cargo valued at $8,120,906.64, and 20,470 revenue tons of transshipped cargo.

*U.N. visiting mission visits a school in Palau District.*

Volume and sales of Guam-produced fruit and vegetables increased
ver 150 percent the last 6 months of 1960, as compared to the same
eriod in 1959.

The poultry program has expanded and commercial egg production
veraged 38,400 dozen per month as compared to 30,150 dozen in
scal year 1960. Four sites were established for an artificial fish shel-
r experimental project and two sites were blasted for reef habitat
nprovement.

Social security was inaugurated for employees outside the Gov-
rnment.

## *Trust Territory of the Pacific Islands*

To develop and unite this strategic territory for the benefit of its
0,000 some inhabitants is the United States role and policy. Probably
owhere in the world are efforts being made to achieve economic prog-
ess, political unity and social advancement in an area so fragmented :
nore than 2,000 islands (97 inhabited) containing less than 700 square
niles of land set amidst 3 million square miles of Pacific waters.

The United Nations Trusteeship Council's annual oral examinatio of conditions in the Territory was conducted at the United Nations i June 1961. The present and former High Commissioners served a Special Representatives of the United States before the Council, wit the Staff Anthropologist and the president of the Truk Congress a Advisers. Earlier in the year, a four-member UN Mission toured th Territory and submitted a report on the U.S. administration.

Increased coconut production continued as a major effort, with adde emphasis on the development of cacao, introduction of spice and frui crops, also new varieties of cash and subsistence crops. Preparation were being made for opening of the Trust Territory Farm Institut an agricultural training school, at Ponape in January 1962. Fis drying and smoking were conducted on a commercial scale as a phase o the Government's fisheries development program at Palau. Prepara tions were underway for a Territory-wide School of Fisheries to ope there in October 1961. Support was given to the Palau Fishermen' Cooperative. A seminar to extend information about the functionin of cooperatives and credit unions is to be held at Palau in July 196 under joint auspices of the Trust Territory Government and the Sout Pacific Commission.

Efforts applied in agriculture and fisheries over the past severa years resulted for fiscal year 1961 in (1) the highest copra productio ever recorded, almost 14,000 short tons, and the highest copra incom approximately $1,700,000; (2) substantial increases in cacao, approx mately 5,000 pounds exported and some 500,000 beans used for seed (3) greater production and sales of marine products, the Palau Fishe men's Cooperative setting a record in 1 month with 27,500 pounds c frozen and smoked fish exported.

## *Legislature Meets*

The Inter-District Advisory Committee, whose members are electe by the representative legislative bodies in each district, met in annua conference during the year. The Social Subcommittee, appointed i 1959, reported its findings and recommendations on problems of educa tion, health and youth behavior. A new Subcommitttee on Econom Development was established and will report at the September 196 conference, and at the same conference a Subcommittee on Politic Development is scheduled to be formed. The program of municipalit chartering was continuing.

Implementing the policy of promoting Micronesians to higher ac ministrative responsibilities as they become qualified through trainin and experience, 61 Government positions in 19 different categori have been filled by citizens of the Territory. A new annual salar hedule was placed in effect, giving increased compensation to 14 icronesians in high-level professional and administrative positions. A scheduled in-service training program was carried out, with Government employees sent from the districts to Guam for ad- nced training in administrative services and in trades and vocations. edical and dental officers (Micronesians) in successive teams received pplemental and refresher training at naval facilities in Guam. ithin the districts, in-service training was provided in a wide range activities including communications, agriculture and fisheries, fety and first aid, legal and constabulary functions, management, counting and clerical procedures, public health services, sanitation d vocational English.

### *ducation Progress*

A newly established School of Dental Nursing at Majuro graduated s first class in June 1961 and the School of Nursing at Palau con- nued to prepare young men and women for nursing careers in the erritory. The training of elementary schoolteachers occupied an portant place in the overall educational program. Model schools ere conducted under supervision of teacher-trainers, who also visited tlying schools to provide guidance and assistance. Grants-in-aid cilitated the building of new elementary schools. Carpentry, echanics, agriculture and fisheries were among courses offered in e several intermediate schools, and at the Pacific Islands Central hool in Ponape.

More than 50 students were attending institutions of higher learn- g in the U.S., Guam, the Philippines and Fiji on Trust Territory overnment scholarships, their courses including general education, edicine, sanitation, agriculture, fisheries, public administration, com- unity development, and vocational training. A like number were udying in similar fields on scholarships provided by their local ngresses or trading companies, while private funds, UN fellowships d other special grants were enabling still others to acquire advanced lucation.

Through development of the Territory's resources—human and ysical—the goals of economic, political and social progress were lvancing.

## *Virgin Islands*

The Virgin Islands continue to make remarkable progress, both olitically and economically. Politically, the elected legislature has own an increasingly mature grasp of its responsibilities, and the

*View of the Oswald E. Harris Court, a 300-family public housing project unde construction in St. Thomas, Virgin Islands. It is expected that this project will b completed by January 1962. It will help to relieve the extreme shortage of adequat housing in St. Thomas.*

territorial government has greatly expanded the scope of its servic and private economy has prospered.

Plans are nearing completion to extend the Harry S. Truman Airport in St. Thomas some 500 feet to accommodate turboprop plane by the end of the calendar 1961, as well as to pave the runoff sectio of the Alexander Hamilton Airport in St. Croix to permit jet plane to land within the next few months.

Distribution of federal surplus commodities to public assistanc clients, which had not been implemented for several years, was give priority attention and the program is now in effect.

A College Conference of leading educators in the United States ha been called for late July to discuss the best ways and means of startin a college in the Virgin Islands.

A new Department of Commerce was created to give fresh impetu to moves needed to bring more business to the islands. An economis and a legal consultant were employed in Washington to make certai that all new plans to encourage commerce would be implemented in way which would not impinge on Federal laws, regulations, an policies.

*ew Kindergarten School at French Village, St. Thomas, Virgin Islands, under nstruction. The wooden building in the foreground was formerly used as a ndergarten school.*

Within the office of the Government Secretary, a new real property x assessment program has been made effective with a scientific ystem of real property appraisal and evaluation.

## *evenues Increase*

The Department of Finance reports total revenue for the fiscal year 961 at $8,872,113.16, an increase of 22.34 percent over the previous scal year, the highest in the island's history.

Within the Department of Commerce a preliminary study reveals at revenues derived from visitors will exceed last year's figures by pproximately 10 percent. Three new small industries were stablished.

In the Department of Education, construction was started on two ew elementary schools in St. Thomas to eliminate overcrowding. Vithin the Department of Health, polio vaccine was given to 97 perent of school children. A new clinical annex of the Charles Harwood emorial Hospital is nearing completion. X-ray facilities were nstalled for the first time at the Frederiksted Clinic.

The Public Works Department is supervising the construction c a number of public works projects including a large elementar school in St. Thomas, a pier at Frederiksted, an abattoir in St. Croix and a number of road projects in all islands. A vigorous plan fo acceleration of street cleaning and garbage removal and beautification has been placed in operation.

The Department of Social Welfare, in collaboration with the Department of Health, instituted the Medical Assistance for the Age Plan providing complete medical care for all persons over 65 year of age meeting eligibility requirements of this Federal program.

The Department of Agriculture and Labor served the farmers b supplying seeds, seedlings, fruit trees, fertilizer and insecticides, lan preparation, marketing of farm products, and farm management.

The Department of Property and Procurement issued awards o major construction projects with total value in excess of $4 million.

The Department of Public Safety conducted a police trainin school for a large number of recruits from all islands and instituted policy of transferring personnel from one district to another. A traffic bureau was created and continued a vigorous campaign agains traffic violators.

## *Government Comptroller*

The Office of the Government Comptroller of the Virgin Islands created by Public Law 517, 83d Congress, approved July 22, 1954, i a Federal Agency under the general supervision of the Secretary o the Interior.

During the fiscal year 1961, this office was very active in makin comprehensive and limited audits of the several departments an agencies of the Government of the Virgin Islands. Special Audit of several governmental activities were also made. The audit o Cashiers' Receipts for fiscal year 1960 was completed.

As required by the Revised Organic Act of the Virgin Islands, a amended, the certification of the net amount of government revenue which form the basis for Federal grants for the civil government o the Virgin Islands, for the fiscal year 1960, was submitted to the Secretary of the Interior, and the annual report of the fiscal conditio of the Government of the Virgin Islands was submitted to the Governor, the Comptroller General of the United States and the Secretar of the Interior.

## *Virgin Islands Corporation*

The Virgin Islands Corporation had a most successful year wit respect to its sugar operations. The sugarcane ground and sugar pro uced was the greatest in the history of St. Croix. Both power sys- ms, St. Thomas and St. Croix, experienced another year of expanding owth which severely taxed available generating facilities. The nstruction of a salt water conversion plant on St. Thomas was started April, and it is expected that the plant will be in operation by ecember.

The production and processing of sugarcane is the major operation the Corporation on St. Croix. The high rainfall during calendar ar 1960 contributed substantially towards making the 1961 sugar op the best in the history of the Virgin Islands. A total of 163,193 ns of sugarcane were ground and 16,555 tons of sugar, raw value, anufactured, both new records. An average production of 44.4 ns of sugarcane per acre was also a record. During 1958 and 1960, oduction dropped to 14.6 tons per acre and 19.4 tons per acre re- ectively when two extreme droughts were experienced. It is sig- ficant that an increase over 1960 of nearly 10,000 tons of sugar uld be realized from the same acreage of land, and the results clearly monstrate the importance that rainfall plays in the production of garcane in St. Croix.

There was considerable improvement in the power situation in St. homas. The 2,500-kilowatt generator, installed in December 1959, as finally accepted by the Corporation and has given good service. he power demand continued to grow at a rapid rate and the increase ver the previous year was 27.2 percent. A steam turbine generator is ing installed in connection with the salt water distillation plant and ill bolster the present output by an additional 2,500 kilowatt. The istribution system on St. John which is served by a submarine cable om St. Thomas was extended to Coral Bay and power will soon be vailable throughout most of St. John.

Power operations on St. Croix received two unfortunate setbacks ue to an electrical fire in the powerplant and the shearing of a piston a high speed engine. A new 2,216-kilowatt diesel engine was pur- hased and will be in operation late in the calendar year. The peak emand increased 18.8 percent over the previous year and undoubtedly ould have been greater except for limited generating capacity.

### *onservation Activities*

A total of 14 earth dams were constructed under the soil and water onservation program in cooperation with the Soil Conservation Serv- e and the Virgin Islands Soil Conservation District Board. The x dams constructed on St. Thomas had an estimated capacity of

2,583,365 gallons and eight on St. Croix, 12,307,941 gallons. Tl growth of the islands has severely taxed all available water sourc and these dams have played an important part in both water co servation and flood control.

The Forest Service continued to cooperate with our Forestry Pr gram, through providing personnel and technical assistance. Tl activities were concerned primarily with reforestation, improveme of existing forest areas, and making available forest products fc utilization locally. The demand for mahogany slabs exceeded avai able supply, and there has been increased use of chemically treate fence posts.

The food production and livestock programs have been expande and plans made for further developments, particularly with cattl A commercial planting of mangos was established and seedlings c macadamia, an edible nut, were introduced from Hawaii where macac amia is a profitable crop.

## *Alaska Public Works*

In 1949, by Public Law 264, the 81st Congress authorized a $7 million program of public works in Alaska to foster economic an social development through provision of facilities for community lif This 5-year act was later extended by Congress to June 30, 195 Under this program the Federal Government, upon application b a public body in Alaska, has financed the entire cost of constructio of approved projects and, upon their completion, transferred the to the public bodies for whom they were built at prices that wi return to the Treasury of the United States not less than 50 perce of the total cost.

The program has provided basic community facilities and othe essential public works. These are a major contribution to Alaska an have materially assisted its communities in meeting the demands o the very rapid population growth of the past ten years.

Through June 30, 1959, Congressional appropriations totalin $69,976,200 have become available. Allotments have been made i the amount of $69,297,160 to 172 projects, to provide 61 school units 13 hospitals and health centers, 8 municipal buildings, 50 sewer an water projects, 27 other projects including streets, utilities and smal boat harbors, and 22 units for emergency relief with a value o $436,400. Of these, 167 projects valued at $62,011,590 are complete Five projects estimated to cost $7,285,570 are substantially complet and in use. These projects are in final stages and are scheduled fo completion by December 31, 1961.

# *The Alaska Railroad*

**D. J. Smith,** ***General Manager***

Operations of the Railroad produced gross revenues of $14,302,279.90. Expenses, including depreciation charges of $2,071,010, amounted to $14,503,804.57. The resulting deficit, $201,524.67, was due, in large part, to wage increases authorized during the fiscal year. These amounted to approximately $171,500. Losses from passenger train operations amounted to about $300,000, further contributing to a deficit operation. Despite the operating loss, the preservation of working assets through the charges for depreciation will provide for capital improvements of about $1,870,000.

The railroad carried 1,313,359 revenue tons of freight, an increase of 5.23 percent compared with the prior year. Revenue passengers otaled 82,742 compared with 76,991 for the prior year, or an increase of 7.47 percent.

The use of containers for the movement of freight in the Alaska rade has found increasing favor with shippers. To meet the growing demand for containerized shipments, the railroad's fleet of unit rail boxes was increased (net) by 106 during the year, to a total at June 30, 1961 of 323. Congressional approval of program changes was obtained in consequence of which authority was granted for the acquisition of 100 additional units. An order for 50 of the boxes will be placed early in fiscal year 1962, with orders for the balance to follow at a later date, contingent upon service demands.

To implement the unit rail box program a 35-ton fork lift was placed in service on the Seward Dock, and cranes were installed at Moose Pass and Palmer.

As part of the continuing program to maintain the roadbed and track in a safe operating condition, the ballasting and tie renewal project begun last year, which covered the 25-mile area south o Curry, was completed. Similar work was started on an additiona 15-mile stretch of track.

The feasibility of the project having been determined previously facilities were installed for the remote control, over wire lines, o VHF radio units at distant stations. This permits direct communication between the dispatcher and trains, between trains and track forces, and between the dispatcher and track forces. In addition t the safety features provided, savings of upwards of $40,000 per yea are anticipated.

The installation of air conditioning equipment in six passenge coaches and two buffet cars during the year featured improvements in passenger service designed to attract tourist traffic. The improvements were made at a cost of approximately $36,000.

Operations and administrative services were constantly reviewe during the year with the objective of improving performance an effecting economies wherever possible. Particular attention was give customer service and relationships. The mission of The Alaska Railroad, as expressed in its enabling act—that of aiding in the economi development of the area—has been stressed repeatedly and efforts o interested citizenry to attract industry and to generate imports and exports through the Port of Anchorage have been encouraged.

# Office of the Assistant Secretary

## *Fish and Wildlife Service*

Frank P. Briggs, *Assistant Secretary*

THE ASSISTANT SECRETARY of the Interior for Fish and Wildlife represents the Secretary in programs designed to preserve important renewable fish and wildlife resources and assure that these resources make a material contribution to the health, recreation, and well-being of our citizens.

These renewable forms of national wealth are capable of being maintained and greatly improved by proper management but equally possible of destruction if unwisely exploited. Properly managed, these resources can provide food and employment, directly and indirectly. The training and recreation afforded by these resources strengthen national defense by contributing to the general health and physical fitness of millions of citizens and the existence of seaworthy ships with trained crews is a direct national asset.

To carry out the responsibilities of his office, the Assistant Secretary functions in both national and international fields. The international aspects of the task stem from the fact that neither birds nor fish respect national boundaries but migrate when and as the forces of nature direct.

The trend toward greater interest in the sea and a greater utilization of its products has accelerated with many Nations increasing the size and efficiency of their fishing fleets and with new national flags appearing on the fishing areas of the high seas. A new interest in the sea has been exhibited by many countries and the concerted r search activities of many American agencies stress the importan of oceanography in meeting and solving resource conservatic problems.

The trend also is for more utilization of outdoor areas by tho who want to hunt and fish and those who want to hike and look whi the developing Nation absorbs more and more of the outdoor are which were once available for recreation and wildlife habitat.

To meet these problems, which are numerous and which cove millions of square miles of land and water, the Assistant Secretar supervises the Fish and Wildlife Service. The work of the Servic is accomplished by two bureaus—Sport Fisheries and Wildlife, an Commercial Fisheries—coordinated by a Commissioner.

In brief, the activities of these units consist of meeting interna tional fish and waterfowl problems through international commi sions, treaties, and conservation; in extensive research on both spo and food fish in laboratories, lakes, streams, and on the high sea by management of the migratory game bird resources and by th operation of a huge National Wildlife Refuge and National Fis Hatchery system; by the management of the great fur seal resource by research on various wildlife problems, including studies o genetics, disease, the effects of pesticides on fish and wildlife, method to control pest and predators without damage to trees, bird bandin studies, breeding and wintering ground studies, techniques for mea uring waterfowl production, and numerous other activities; explora tory fishing and gear improvement programs to help the America fisherman in his competitive relationship with the fishermen of othe Nations; intensive study to get the most and best nutritive value fro sea products; and so on through an almost endless roster o activities.

More detailed reviews of the problems and operations of the fis and wildlife program are discussed in the following pages.

# ish and Wildlife Service

## larence F. Pautzke, *Commissioner*

HE COMMISSIONER OF FISH AND WILDLIFE heads the Department of e Interior's Fish and Wildlife Service and coordinates the work f its two component bureaus—the Bureau of Sport Fisheries and Vildlife and the Bureau of Commercial Fisheries. He is a member f several international fisheries commissions. In the Office of the ommissioner are staffs handling conservation information-educaon work, program review, and international activities.

### *onservation Education*

The purpose of the educational activities of the Commissioner's ffice is to create public understanding and appreciation of the conervation goals, efforts, and practices of the Fish and Wildlife Service.

Its activities are based upon the concept that the public should know ot only what its conservation agencies are doing with their stewardhips but also should know why the actions were taken. Only when here is public understanding of the necessity for conservation can here be an intelligent public appraisal of and support for conservation rograms.

A new duck identification field guide, Know Your Ducks, an illusrated shirt-pocket-sized leaflet, was issued and 600,000 copies were rdered for distribution before the fall waterfowl hunting season tarted. An identification motion picture featuring field pictures and rtists' drawings was in production when the fiscal year ended. This vould be ready for distribution during and after the hunting season.

These two items, the field guide and the motion picture, will be mportant tools in helping the average hunter learn how to identify ducks and how to avoid killing birds in short supply. The species i short supply often vary from year to year because of changing cond tions. Good sportsmanship and good waterfowl management dicta that hunters learn how to identify the various hunted species. T this end, every possible effort is being made to aid hunters learn t "know your ducks."

Preparations were made for the compilation and the distributio of 2 million waterfowl hunting regulations Digests, 600,000 Diges on dove hunting regulations, small leaflets which give the hunter muc of the data he needs on hunting regulations. The 1961–62 issue c the Answers to Your Migratory Bird Hunting Questions was mad available.

Conservation Backgrounds, an interpretative series which helps th reader understand various conservation problems, was continued.

A motion picture on safety was produced, and footage for an edu cational motion picture on commercial fishery biology was prepare

Two new exhibits were prepared for use in two of the Bureau o Sport Fisheries and Wildlife regions. Material was supplied fiel men and conservation agencies for the promotion of the after-seaso sale of duck stamps for the acquisition of migratory waterfowl.

## *Safety*

The Office of the Commissioner sponsored and coordinated an activ Safety program to reduce work injuries, property damage, moto vehicle accidents, fires, and tort claims in the component bureaus o the Fish and Wildlife Service. Regional facilities of both bureau have aggressively participated with resultant reductions in the cos of all but property damage accidents. Records based on the calenda year show a continuing reduction in the disabling work injur frequency. The Bureau of Commercial Fisheries received the Department of the Interior Safety Award in recognition of an outstanding Safety program, achieving substantial reduction of disablin work injuries in competition with other bureaus of the Departmen during the calendar year.

## *International Activities*

The nine existing international fishery commissions continued t apply generally effective cooperative effort in the conservation o fishery resources of importance as food for the ever-growing worl population. Also, the outlook is bright for improved conservatio measures for the migratory birds of great value to Canada, Mexico and the United States.

The Fish and Wildlife Service assisted the International Coopera- on Administration in providing technical assistance to friendly reign countries in the development of fish and wildlife resources. Fishery technicians were on regular assignment to 11 countries; and special survey was completed in Panama, and another in several untries of West Africa was initiated. A number of foreign students nd observers were given training in the United States in the fields of fisheries and wildlife.

# Bureau of Sport Fisheries and Wildlife

### Daniel H. Janzen, *Director*

THE BUREAU OF SPORT FISHERIES AND WILDLIFE of the Fish and Wild-ife Service, Department of the Interior, recorded several events during the year of paramount importance to wildlife conservation and public recreation.

Acquisition of lands for waterfowl was greatly accelerated. Funds were obligated for the purchase of 43,461 acres for refuges and 25,000 acres of small wetlands for waterfowl production—more than seven imes the acreage for which funds were obligated during the preceding year. With establishment of three large wildlife areas on public lands n Alaska, the National Wildlife Refuge System was increased from 7½ million acres to 28½ million.

Complete protection given canvasbacks and redheads in the 1960–61 hunting season resulted in an increase in their numbers. Although he continental population of migratory waterfowl remained nearly constant in the past year, mallards and black ducks declined slightly n numbers.

In the greatest offensive ever conducted against market hunting n the United States, 169 persons were arrested or cited to court in single day. They had sold some 5,000 illegally killed ducks and geese to an undercover agent posing as a market buyer. Such mass arrests illustrate well the effectiveness of the undercover agent system nd the extent of market hunting.

## *Research Gets Attention*

Intensive study of the effects of pesticides and herbicides on wild-life continued. Under laboratory conditions chemicals commonly used to control insects and weeds were found to inhibit breeding mallards and pheasants; also it was found that big game animals treated western forests may accumulate residues of insecticides their bodies. Studies are continuing in an effort to learn the lon term chronic effects of these modern chemicals on fish and wildli and to find effective agents that do not create unusual hazards f living natural resources.

Research on light traps, scaring devices, immobilizing chemical and sterility-producing agents to control birds and animals that dar age agricultural crops and foul cattle feed lots had promising result Wide use by farmers of the Bureau-developed pocket gopher burro builder, which deposits bait in underground burrows, gave quick pr tection of crops at reasonable cost.

Reduction of hazards to aircraft at airports by flocks of starling gulls, and swallows, was studied in cooperation with the Feder Aviation Agency. It was recommended that airports be made le attractive to the birds by removing feeding areas, nesting sites, ar roosting places.

### *Game Fishing Popular*

In recognition of the importance of marine game-fish resources ar their recreational value to Americans, a marine game-fish researc program was established at Sandy Hook, N.J. Inventories of th valuable resource are in progress on the Atlantic, Pacific, and Gu coasts.

More than 1,880,000 man-days of sport fishing were enjoyed b Americans on national wildlife refuges, national forests and park and on military installations and Indian reservations, as a result c cooperative programs between the Bureau and other Federal agencie

National fish hatcheries increased their output of young fish 1 percent during the year, largely to meet the increased demand fo trout to be stocked in newly created tailwaters below large dams.

## *Management of Fish and Wildlife*

Provisions of the amended Migratory Bird Hunting Stamp Act o August 1, 1958, which became effective July 1, 1960, earmarked all pr ceeds from the sale of Duck Stamps (except expenses incurred by th Post Office Department in connection with sales) for the location ar acquisition of lands for waterfowl use. In a greatly accelerated pr gram of land acquisition, funds were obligated for the purchase o

*Some of the 50 million Americans who get rest and recreation from fishing in the Nation's lakes, streams, and reservoirs.*

3,461 acres of land for refuge purposes and 25,000 acres of small wetlands for waterfowl production purposes.

Eight national wildlife refuges were established during the year: Wapanocca, Ark., and Burford Lake, N. Mex., on leased land; Kern and Modoc, Calif.; Mackay Island, N.C.; and Ouray, Utah, on purchased land; Washita, under provisions of the Fish and Wildlife Coordination Act, on Foss Reservoir in Custer County, Okla.; and San Juan, Wash., on lands withdrawn from the public domain.

The 5,966-acre Modoc Refuge in northeastern California is an important breeding area for Great Basin Canada geese and will provide balanced habitat for Canada geese and ducks. To the south in the San Joaquin Valley, the newly acquired 10,544-acre Kern National Wildlife Refuge is in a region in which waterfowl formerly darkened the skies. As sources of water are developed, large populations of ducks and geese are expected to congregate here.

## *Winter Grounds for Snow Geese*

The recently established Mackay Island Refuge, in the northeast corner of North Carolina, is in the heart of the famous Back Bay-

Currituck Sound waterfowl area. In addition to providing a restin and feeding area for a heavily gunned population of important water fowl species, the refuge attracts the largest wintering concentration o greater snow geese remaining in North America.

The San Juan National Wildlife Refuge—52 acres of rocky island off the coast of Washington in the Strait of Juan de Fuca—is a natura haven for oystercatchers, gulls, cormorants, puffins, guillemots, an other migratory birds. There is an influx of northern sea birds durin the winter months.

## New Alaska Areas

By administrative action, three national wildlife ranges on publi land in Alaska were established. The ranges total 11,185,000 acres

The 8,900,000-acre Arctic Range is the only area in the Unite States where an undisturbed portion of arctic environment, larg enough to be biologically self-sufficient, will be preserved. The rang will save unique wildlife, wilderness, and recreational values that ar outstanding in North America. Major game species include th grizzly, black, and polar bear; caribou; Dall sheep; moose; an wolverine.

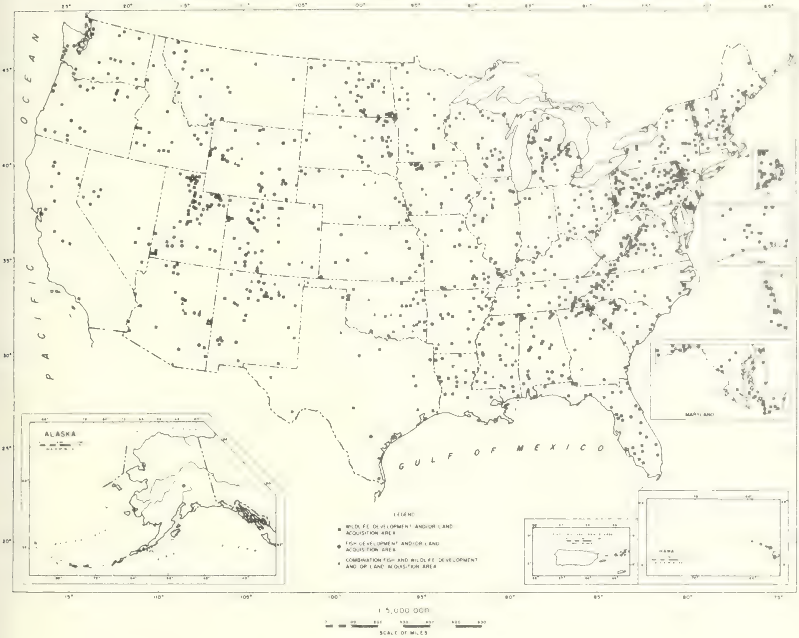
The Clarence Rhode Range, 1,800,000 acres of low-lying tundra o the coast of the Bering Sea, is the primary nesting area of the cacklin goose and the major nesting ground of the black brant in the Unite States. Emperor, lesser Canada, and white-fronted geese; whistlin swans; little brown cranes; eiders; pintails; scaups; common scoters and oldsquaws nest on the range, as do many shorebirds.

The 415,000-acre Izembek National Wildlife Range, on the ti of the Alaska Peninsula, is a waterfowl feeding area with vast eel grass beds in Izembek Bay and tremendous crops of berries in the bor dering upland tundra. The tidal lagoons support nearly the entir continental population of black brant for 2 to 3 months of each yea The range is also within the principal migration lane of cackling an lesser Canada geese and supports a number of other species durin the fall and early winter.

## Pothole Drainage Combated

Thousands of potholes and marshes have been drained in th Dakotas and Minnesota in the past 25 years, and more will be draine in the future. This important pothole area is in the southern par of the best waterfowl-producing grounds on the North America Continent. Public ownership and leasing are the most practical way

MAJOR FEDERAL AID FISH AND WILDLIFE DEVELOPMENT AND LAND ACQUISITION AREAS


PACIFIC OCEAN
GULF OF MEXICO
ALASKA
MARYLAND
HAWAII
LEGEND
WILDLIFE DEVELOPMENT AND/OR LAND ACQUISITION AREA
FISH DEVELOPMENT AND/OR LAND ACQUISITION AREA
COMBINATION FISH AND WILDLIFE DEVELOPMENT AND OR LAND ACQUISITION AREA
1:5,000,000
SCALE OF MILES

*ince the inception of the cooperative program between the States and Federal overnment, known as the Federal Aid in Fish and Wildlife Restoration Program, early 2½ million acres of land and water have been acquired and developed at a ost of $51 million. Virtually every State is actively engaged in this form of fish d wildlife restoration.*

o preserve this habitat and ensure a place for ducks to nest and raise heir young.

Using funds provided by the sale of Federal Duck Stamps, 146 racts were optioned or acquired for waterfowl production areas in orth and South Dakota this year.

## *port-Fish and Wildlife Restoration*

Funds totaling $5,485,000 were apportioned to the States and island ossessions for Federal aid in sport-fish restoration during 1961. and acquisition to provide more recreational fishing areas continued o be an important part of the program. This continuing endeavor as resulted in the completion of 165 public fishing lakes, covering ome 21,300 acres, in the period between July 1, 1951, and June 30, 961.

During this 10-year period, 384 public access areas have been purhased and developed with fish-restoration funds, opening more than

800 miles of streams and 40,000 acres of lakes to public fishing Research was primarily concerned with population dynamics and th control and estimate of harvest.

States and island possessions were apportioned $14,217,430.17 i 1961 for Federal aid in wildlife restoration. Land acquisition wa a major objective in many States. Fee title purchase of 146,912 acre in 1961 at a Federal-State cost of $5,059,288 brought the overall tota of lands purchased under the Federal Aid Program between 1938 an 1961 to 2,403,684 acres, at a combined State-Federal cost of $51,305,354

States continued to develop and manage the lands within thei jurisdiction that were acquired under the Federal Aid Program Habitat improvements to meet the food, water, and cover requirement of wildlife using the areas made up the main activities under development projects. Research continued on all major and migratory gam species.

### *Wildlife Management*

Responsibilities of the Bureau under the Migratory Bird Treat Act necessitate obtaining current, reliable data on the status an distribution of migratory waterfowl populations in North Americ in order to establish a basis for prescribing annual hunting regulation

To accomplish this objective, the following waterfowl surveys wer conducted: (1) A survey of waterfowl hunters following the huntin season to measure the extent of the kill and the effect of regulation on hunting activity and kill; (2) A January survey of continenta wintering areas to measure the distribution and relative number o birds after the close of the previous hunting season; and (3) A surve of the major continental breeding areas during May, June, July, an August, to measure the size and distribution of the breeding population and the number of young produced.

The trend of the continental migratory waterfowl populatio generally remained fairly constant. Some major species, such a mallard and black ducks, showed slight losses, while other specie showed substantial gains. In this latter group, canvasback and redhead increased significantly following a complete closure on these tw species during the 1960–61 hunting season.

### *Fishery Management*

Public use of the many fine fishing waters on Federal lands tha resulted from fishery management activities of the Bureau has almos doubled in the past 2 years. Cooperative fishery programs with th Department of Defense, Veterans' Administration, Forest Service he Department's National Park Service and its Bureau of Indian Affairs, and Indian tribes, and on Wildlife Refuges themselves reulted in an estimated 1,880,000 man-day of recreational fishing in 960.

Two laws approved by the 86th Congress are of special significance: Public Law 86–797, known as the Sikes Act, authorized the formaion of cooperative plans for fish and wildlife on military areas, inluding use of special permits for fishing and hunting; Public Law 86–686 authorized cooperative units in sport fisheries. These units will rain fishery scientists and conduct research and surveys of fishery resources of national interest.

*Sport fishing on Federal lands that resulted from cooperative fishery management activities*

| Area | Number of installations | Days of fishing |
|---|---|---|
| Department of Defense: | | |
| Air Force | 34 | 98, 598 |
| Army | 49 | 252, 776 |
| Navy and Marine Corps | 21 | 54, 467 |
| Veterans' Administration | 12 | 27, 250 |
| Indian reservations | 26 | 305, 450 |
| National parks | 7 | 60, 400 |
| National forests | 10 | 376, 500 |
| Wildlife refuges | 32 | 698, 648 |
| Miscellaneous areas | 9 | 14, 272 |
| Total | 200 | 1, 888, 361 |

## *River Basin Studies*

The Bureau participated with the Manitoba Department of Mines and Natural Resources in a study of the effects of the Grand Rapids hydroelectric project, Saskatchewan River, Manitoba, on fish and wildlife resources. A report of the study was transmitted to the Manitoba Government on March 10, 1961. The Bureau report indicated the high value of 1,600,000-acre reservoir area as fish, waterfowl, fur animal, and moose habitat and recommended measures to lessen about one-half the tremendous wildlife losses predicted.

A schedule of daily values for use in evaluating the effects of Federal dams and other water-resource projects on fish and wildlife has been developed in cooperation with other Federal agencies. Use of this schedule of values for fishing and hunting is a forward step in the consideration of the multiple effects of such projects on flood control, irrigation, agriculture, navigation, and fish and wildlife. The schedule will be improved and probably will be extended to other types of recreation that are becoming so popular in connection with such projects.

To stimulate public interest in utilizing opportunities for increasing fish and wildlife recreational benefits, the Bureau prepared an published Circular 100, entitled *Better Hunting and Fishing on Smal Watershed Projects.* This 12-page illustrated circular describes th types of fish and wildlife developments eligible for Federal cost-sharing and outlines procedures for their inclusion in projects constructe under provisions of the amended Watershed Protection and Floo Prevention Act.

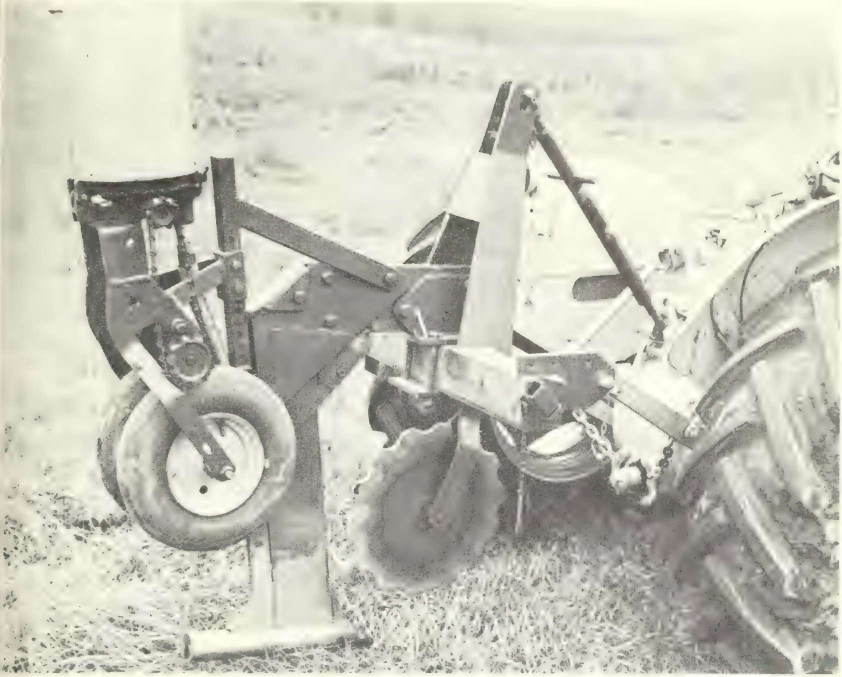
## *National Fish Hatchery Program*

The stocking of inland waters with fish from national fish hatcherie was directed toward providing the greatest recreational enjoymen to the maximum number of people in 1961. The national program i planned (1) to meet fish stocking needs in areas owned or controlle by the Federal Government, (2) to assist the States to stock publi waters where recreational fishing is high and State programs are no adequate to meet stocking needs, (3) to provide the initial stoc of fish for farm ponds in cooperation with the States, and (4) t improve fish-cultural techniques, especially for species difficult t propagate, and to make this information available to the States.

Recreational fishing has shown tremendous gains in popularity i recent years. This trend has made it necessary to explore ever means to maintain existing sport-fish populations and build up ne populations as environmental conditions permit. The stocking o trout in tailwaters below major dams resulted in the creation of majo fisheries on several river systems. The stocking of farm ponds continues in a major effort to provide fishing for a rapidly increasin number of anglers. The farm-pond program has made sport fishin available to lower-income groups, formerly deprived of this form o relaxation.

Greater attention was given during the year to applying researc findings to fish production, primarily in the fields of nutrition an disease. In-service training schools at Cortland, N.Y.; Leetow W. Va.; Marion, Ala.; and Seattle, Wash., were operated at capacit to increase the fish-cultural knowledge of hatchery employees.

The Congress provided funds to complete the replacement of th Miles City, Mont.; and Edenton, N.C., warm-water fish hatcherie and to continue the construction of new hatcheries at Alchesay an Willow Beach, Ariz.; Garrison Dam, N. Dak.; and Gavins Poin S. Dak. Also, the Congress provided funds to continue improvemen and expansion of facilities at 10 existing hatcheries. Funds wer provided for study of a potential fish hatchery site in the Walke Lake area of Nevada.



*The burrow builder, developed by the Fish and Wildlife Service, helps the farmer protect his crops from burrowing animals by constructing artificial burrows and depositing poison bait in them.*

## *Controlling Harmful Animals*

The Bureau's cooperative program with State, County, and other local governments and organizations, and with agriculture and industry, reduced the depredations and transmission of diseases by mammals and birds. Selective techniques, carefully applied, lessened the severity of the damage to crops and losses of domestic stock without endangering other animals. Human activity and modern complex technology have brought new conflicts with wildlife. Restrictions on remedial efforts increased as a recreation-seeking public made more and more use of public lands, and safety precautions to prevent injury to people, pets, and domestic animals received special attention. Less efficient and more tedious techniques replaced better, but more hazardous, methods on many multiple-use areas at increased cost.

Cooperative predator control projects with State conservation departments resulted in increased game supplies and thus aided recreational hunting.

The burrow builder, a major improvement for protecting agricultural crops from pocket gophers, was introduced early in the fiscal year. Attached to a tractor, it constructs an artificial burrow underground and deposits bait in the tunnel. Machines are already widel used, with an estimated 100 in the States of Minnesota and Wisconsi alone. For the first time, many farmers were able to give their crop adequate protection from burrowing animals at a reasonable cost

Techniques for controlling depredations by nuisance and harmfu animal species were demonstrated to many groups of agriculturalist and students, and to numerous organizations. Assistance with programs to reduce the incidence of rabies in wildlife continued to sho good results. Radio and television programs, how-to-do-it leaflets and the Bureau's rabies and rodent control exhibits provided usefu information to millions of people. New sets of colored slides illustrating wildlife damage problems and methods of control were produce and shown to audiences throughout the country.

### *Enforcement Activities*

The Bureau's relentless and sustained offensive against the marke hunter and his commercialization of migratory game birds has agai forcefully illustrated the threat which this type of activity poses t the welfare of the resource. The extent of this activity is evident fro the arrest of 169 individuals in five States on May 5, 1961. Durin the past 2½ years they had sold some 5,000 ducks and geese to a undercover agent.

This mass arrest of market hunters was the largest operation of it kind ever conducted in the United States. The Congress expressed it awareness of the seriousness of this crime when it amended th penalties provision of the Migratory Bird Treaty Act by enactin Public Law 86–732, approved September 8, 1960, which provides fo a fine of up to $2,000 or 2 years in jail, or both, on conviction for sellin or taking migratory birds with the intent to sell.

The following table compares the frequency of violations of fish an wildlife conservation laws administered by the Bureau of Sport Fisheries and Wildlife in the fiscal years 1960 and 1961:

| | Fiscal year 1960 | Fiscal yea 1961 |
|---|---|---|
| Cases pending at beginning of year | 485 | 7 |
| New cases | 4, 808 | 5, 1 |
| Cases terminated: | | |
| Declined | 333 | 2 |
| Dismissed | 167 | 1 |
| Acquitted | 150 | 1 |
| Won | 3, 928 | 4, 2 |
| Cases pending at end of year | 715 | 9 |
| Fines and costs: | | |
| Suspended | $10, 741. 70 | $8, 484. |
| Paid | $147, 629. 37 | $150, 168. |
| Jail sentences: | | |
| Suspended | 3,080 days | 6,247 da |
| Served | 2,816 days | 3,335 da |

In addition to cases involving violations of Federal regulations, U.S. game management agents participated in the apprehension of ,079 persons for violation of State wildlife conservation laws; 1,953 of these cases were terminated in State courts with $73,140.50 in ines and costs assessed along with 4,473 days of jail sentence; $7,603.50 of the fines and costs and 3,214 days of jail sentences were suspended.

### *Refuge Visitors*

The 11 million persons who visited the national wildlife refuges n 1960 were far outnumbered by the waterfowl visitors. Last year, there was the astounding total of over 1.5 billion "duck-days" on the refuges. For example, one bird remaining on an area for a week is counted as 7 duck-days. Only use of a refuge by ducks, geese, swans, and coots is represented in this figure. In addition, thousands of herons, shorebirds, gulls, terns, and even greater numbers of songbirds use the refuges. An estimated 132,000 big game animals on the national wildlife refuges largely remain there throughout the year, as do many small fur animals.

Unlike human visitors, wildlife obtains its food on or near the refuge. To supplement the natural foods—tons of aquatics, marsh foods, and other natural foods, and an estimated 600,000 tons of green forage—100,000 refuge acres were farmed by refuge personnel or by neighboring farmers on a cooperative basis, to produce 2 million bushels of grain for the wildlife visitors.

## *Fish and Wildlife Research*

Twelve laboratories and their 11 field stations were engaged in 241 research work units during the year. Quarterly progress summaries and an annual progress report were distributed to related and cooperating State and Federal agencies, and 65 manuscripts were published or in press at the end of the fiscal year.

The research organization provided for 148 professional and supporting fishery research workers in the fields of fresh-water and marine biology, chemistry and biochemistry, pathology, parasitology, microbiology and histology, entomology, and fish husbandry.

Field observations on insect and plant pest-control operations are revealing the incidental effects of the chemicals on fishes, but more important, they are suggesting means of lessening damage to the resource. A laboratory bioassay technique being developed promises to supplement, verify, and hasten the often tedious chemical analyses for minute pesticide residues. In a long-term study assessing the chronic effects of DDT, groups of cutthroat trout are periodically exposed to various sublethal dosages in water or in their food to determine effects on survival, growth, and reproductive potential.

## *Marine Game Fish*

In August 1960, the new marine game-fish research program was commenced with the establishment of a laboratory at Sandy Hook, N.J. The staff consists of eight marine biologists, seven on the Atlantic coast and one on the Pacific coast. A contract was arranged with the Bureau of the Census for the collection of catch statistics by coastal areas and by species and of other related data. To complement this information, an inventory of marine angling facilities is being made with the view to preparing a national atlas. The entire staff is collaborating on a systematic compilation of available knowledge on marine game-fish species. Subjects in preparation at the close of the year included dolphins, sea trouts, bluefish, striped bass, and coastal hydrography.

## *Estuarine Studies*

A pilot estuarine study at the mouth of the Shrewsbury River was commenced and coordinated with a similar Delaware Bay study of the Bureau of Commercial Fisheries in connection with its menhaden research. Two graduate students were employed: one at the University of Miami Marine Laboratory for research on the life history of the red drum; and the second at Columbia University, in hydrography.

Planning and consulting sessions were held throughout the year with the three interstate marine fishery commissions—Atlantic States Marine Fisheries Commission, Gulf States Marine Fisheries Commission, and Pacific Marine Fisheries Commission—and with groups of marine biologists of the coastal States and the Bureau of Commercial Fisheries.

Research begun in 1949 on the important Yellowstone Lake cutthroat trout resource will be completed during calendar year 1961. An average yield of 325,000 fish has been set as a catch goal for resource-management purposes. Several possible measures, as alternatives or in combination, have been suggested to the National Park Service to relate the angler catch in the future to the productive capacity of the lake. Year-to-year fluctuations in trout runs to certain important tributaries of Yellowstone Lake have been related to water levels during the spawning and incubation periods, and a

*Bureau and State waterfowl biologists sexing and aging duck wings as measure of waterfowl production.*

formula has been developed for predicting stream production, to be used in establishing fishing regulations.

## *Wildlife Research Activities*

Much of the Bureau's wildlife research was conducted with the support and cooperation of other State and Federal agencies, private conservation groups, and industries, including chemical manufacturers and timber growers. Hunters also aided in the research effort by submitting waterfowl kill figures and the wings of 36,000 ducks and more than 11,000 woodcock for use in analyzing productivity in these species.

Studies of pesticide-wildlife relationships continue to be an important segment of the Bureau's research. Extensive parts of the woodcock's winter range are near or within areas that have been treated with heptachlor for control of the imported fire ant. Samples collected 1 or more years after application of the insecticide contained as much as 0.2 parts per million of heptachlor residues in soils and 6 parts per million in earthworms. Heptachlor residues have been found in a high percentage of woodcock taken in these areas and studies have been initiated to determine the toxicity of heptachlor to this species. Preliminary results indicate that toxic effects are more likely to occur during periods of reduced food intake than when birds have free access to food.

## *Pesticides Affect Wildlife*

Tests with captive mallard ducks have shown that some commonl used herbicides, including aminotriazole, dalapon, and derivative of 2,4-D and 2,4,5-TP markedly inhibit reproduction. No live youn were produced by birds that had taken 250 mg./kg./day of these toxicants during a 200-day period before and during the breeding season

Abnormal coloring of the plumage of male pheasants and damag to the reproductive organs of both sexes occurred when young o adult birds were given 2 mg./kg./day of Kepone for 60 to 100 days No live chicks were produced by birds fed at this or a higher rat before and during the breeding season. Normal coloring of th feathers began to appear within 60 days after Kepone was remove from the diet. Doses of approximately 15 percent of the estimate lethal rate produced these effects. Pheasants fed diets containin Kepone had mottled livers and lowered reproduction.

Studies of pesticide-residue accumulation in the tissues of big gam animals show that when their forest habitat has been treated wit DDT at the rate of 1 pound per acre, the animals accumulate th poison in amounts exceeding the tolerance levels established by th U.S. Pure Food and Drug Administration for meat from domesti livestock.

Appraisal of the long-term and indirect effects on wildlife of fiel applications of pesticides will require continuing and carefully designed studies. Such a study now being conducted by the Massachusetts Cooperative Wildlife Research Unit has as an objective to determine the effects of sublethal doses of DDT and Sevin on songbird reproduction, namely the towhee.

## *Bird Concentration Problems*

Bird concentrations continue to present perplexing problems. Severe damage to growing crops, particularly grains, was reported from nearly all sections of the country, while hazards to aircraft have increased alarmingly. Increased emphasis has been given to the development of bird-control methods following the tragic crash of a propjet airliner in Boston on October 4, 1960, when it became involved with a large flock of starlings in flight.

This research supplements studies on methods of reducing crop damage by birds and other animals. The Federal Aviation Agency, much concerned about bird hazards to aircraft, provided financial and other support for studying this problem which has become more acute with the increased use of jet planes.

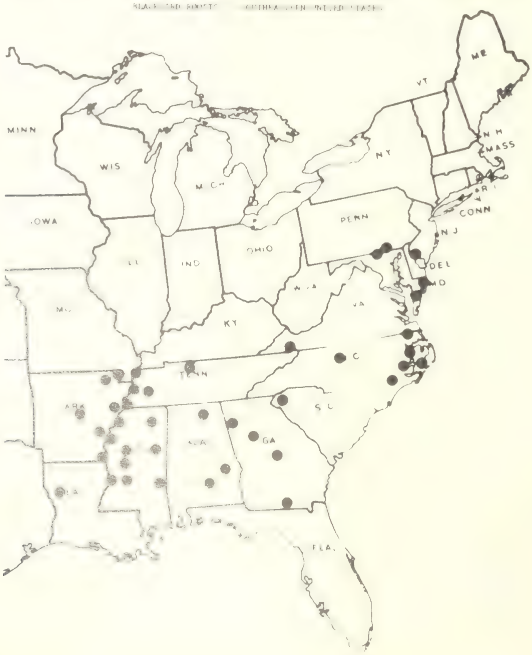
*This concentration of birds at a city dump, which includes more than 10,000 gulls, fish crows, and blackbirds, constitutes a serious threat to the safety of passengers and crews of planes landing and taking off at an adjacent airport.*

Surveys have been made at airports in various parts of the country and recommendations have been made for alleviating the bird hazard. In many instances this was accomplished through the use of scaring devices such as shell crackers, shotgun shells, and carbide exploders. Another approach has been to modify the airport environment by eliminating certain types of cover or attractive food sources.

Wildlife Leaflet 429, issued by the Bureau and the Federal Aviation Agency and entitled *Bird Hazard to Aircraft*, outlines several methods of reducing the hazard. Birds, particularly gulls, continue to be a problem in the operation of aircraft on or near airports, however, and intensified studies have been initiated to (1) obtain more information on the extent and nature of the problem, (2) test commercial materials and devices in bird control at airports, (3) determine the potential usefulness of sterility-producing agents and selected lethal chemicals, (4) investigate sonic, ultrasonic, and electronic media as bird deterrents, and (5) observe bird behavior and responses in probem areas.

Increased attention has been given to blackbirds, which cause exensive damage to corn, rice, and other crops, and starlings, which consume and foul the feed in cattle feed lots in parts of the West.

*Blackbirds and starlings are among several kinds of birds subject to Fish and Wildlife Service biologists' research to alleviate depredation problems. Winter roosts, some of them comprised of millions of birds, have been located in the southeastern United States. Inset: Locations of 41 roosts found up to March 1961.*



*esearch biologists, such as the one shown here talking to a group of Boy Scouts bout wildlife diseases, make a valuable contribution to conservation education and ublic information programs of the Fish and Wildlife Service.*

nd damage holly grown in eastern Oregon. The floodlight trap has een improved in design and operation. This was demonstrated in anuary 1961, at Walnut Ridge, Ark., a rice-growing area, when 2 nights of operation more than 200,000 blackbirds were captured. 'orty-one major blackbirds roosts, each containing an estimated mil-on or more birds, have thus far been located through cooperative urveys in the Southeast.

### *ther Research Activities*

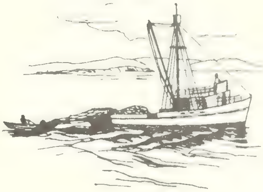
The Cooperative Wildlife Research Unit Program, jointly sup-orted by the Bureau, the Wildlife Management Institute, and 15 tates, completed its 25th year. Last year, 243 students graduated rom unit schools, for a total of 3,445 graduates since the program egan in 1935. Active research projects numbered 254, with 195 in ildlife subjects and 59 in fisheries. The program produced 154 ublications in 1960.

An aerial survey was made during the year of the walrus popula-ion off the coasts of Alaska in parts of the Bering Sea. On the basis of the areas covered in the survey and the animals actuall seen, Bureau biologists estimate a population of as many as 90,00 walrus.

Through the Foreign Game Importation Program conducted i cooperation with interested States and the Wildlife Managemen Institute, 6,033 exotic game birds of several species considered suitabl for trial release in game-deficient areas were delivered to 12 States.

# Bureau of Commercial Fisheries

### Donald L. McKernan, *Director*



The Bureau of Commercial Fisheries of the Fish and Wildlife Service, Department of the Interior, has responsibilities for maintaining the welfare of the fishing industry and conserving and managing the resources upon which the industry depends. A wide variety of services and research are performed by the Bureau.

The fishing industry is an important producer of food and byproducts. The 1960 production of the U.S. commercial fisheries was the third largest in the country's history—4.9 billion pounds valued at $347 million. There were decreases in landings of menhaden, Alaska herring, and Pacific sardines; however, catches of clams, crabs, sea scallops, and halibut established new records. The canned packs of cat and dog food and tuna were also at alltime highs, and there were record productions of menhaden oil, tuna and mackerel meal, and frozen fish sticks and portions.

## Research

The research of the Bureau has been in many fields, including food technology, biology, oceanography, exploratory fishing, gear research, and economics. Results of some research projects are briefly recounted.

### *Salmon*

The Pacific salmon has been one of the country's most valuable fisheries during this century, and it is appropriate that a great amount of biological research be expended in a study of the salmon resource.

During the last decade the abundance of salmon, particularly Alaska, has declined. This decrease in such an important resou has stimulated even greater efforts toward gaining an understandi of how to manage the fishery more effectively. Salmon resear covers many aspects of the biology of the five species of Pacific salmc

The continuing reduction of spawning areas by power and irrigati dams requires the providing of substitute spawning areas. O method of doing this is by artificial spawning channels. In the Upp Sacramento River, Calif., use of such channels has increased t rather low hatching survival rate of king salmon eggs severalfold.

Management of Alaska salmon runs is usually accomplished l regulating spawning escapements to streams. In many pink salmc streams most spawning occurs in the intertidal zone. It is importa to know the rate of survival from such spawning. At Olsen Ba Prince William Sound, Alaska, studies of intertidal spawning l pink salmon disclosed that after 1 month, survival rate of eggs at tl upper limits of tidal inundation was 90 percent as opposed to onl 47 percent in the lower zone, 3 to 4 feet above mean low tide.

Also important to salmon management is a knowledge of tl nature of the homing and migration of salmon. At Spring Creel Wash., studies of the sensory perception of salmon showed that odc plays a major role in the final stages of "homing" whereas sight relatively unimportant.

There is a particularly urgent need for additional scientific ir formation on salmon because the North Pacific salmon convention wi be open for renegotiation in 1963. The United States then negotiate with Canada and Japan on salmon fishing restrictions in the North east Pacific. Late in the fiscal year, work was commenced on a 1½ year emergency salmon research program under a $1 million supple mental Congressional appropriation. This will enable the Burea to produce better predictions of runs and determine optimum escape ments of mature fish.

### *Tuna*

The most important fishery on the Pacific coast is tuna. Two bio logical laboratories, at San Diego, Calif., and Honolulu, Hawaii, per form research on the commercially important species of tuna. Severa major accomplishments were noted during the year.

Tentative identification of albacore, bigeye, and bluefin tuna larvae was made from specimens collected by the Danish research vesse *Dana* in the western Pacific and Indian Ocean and by the Bureau's research vessel *Charles H. Gilbert* in the central Pacific southwest of awaii. Eggs and larvae of these species were previously unknown. hese identifications have opened the way for a study of the seasonal d geographical distribution and abundance of larval tuna throught the Pacific.

Studies of blood groups of skipjack tuna indicate that this species s different subpopulations associated with major island groups in e Pacific. In contrast, similar studies on the albacore revealed that has one far-ranging oceanwide population.

### *ological Oceanography*

If we are to use our marine resources wisely, it is increasingly aprent that we need to know a great deal more about biological oceagraphy—the science of the interactions between marine life and the a. Recognizing the importance of this field of science, the Bureau accelerating its biological oceanographic activities.

An expanded program of biological oceanography in the Atlantic d Pacific Oceans and the Gulf of Mexico is being coordinated with e oceanographic research of other agencies through membership on e Interagency Committee on Oceanography of the Federal Council r Science and Technology. The Bureau is contributing funds to e support of the National Oceanographic Data Center, which was dicated in January 1961, and a staff member is serving on the Intergency Advisory Committee for the Center.

Oceanographic research emphasis has been in the North Pacific cean because of United States' membership on international fishery mmissions dealing with salmon and tuna. Impending international hing regulations require immediate knowledge on how the marine imate influences the distribution and availability of these two groups fish. To this end, there have been published 10 of a planned series 24 topographic charts of the eastern Pacific showing location of a mounts and other features of the ocean floor that have a bearing tuna concentrations. Since research indicated that temperature s an important influence on tuna distribution, monthly temperature arts have been issued to aid fishermen in locating tuna. Such charts e also useful to fishery scientists, oceanographers, and meterologists.

### *reat Lakes*

The sea lamprey invasion into the Great Lakes has caused a drastic ange in the abundance of fish. The sea lamprey has decimated the ocks of lake trout; however, there have been great increases in the mbers of certain species, such as chubs and alewives, which formerly ere preyed upon by lake trout. Bureau efforts in the Great Lakes

*Since the Great Lakes provide an important commercial fishery, they are subject*
*considerable biological research by the Fish and Wildlife Service. The "Cisco" is*
*Service vessel regularly used in investigating Great Lakes fishery problems.*

are designed to bring the sea lamprey under control; restore the lak
trout stocks; and, in the meantime, develop methods for capturin
and utilizing the supply of newly abundant fish.

Under the auspices of the International Great Lakes Fishery Com
mission, the Bureau and the Fisheries Research Board of Canad
treated with a selective toxicant all 72 tributary streams of Lak
Superior known to contain larval sea lampreys. This project, begu
in 1958, represents a major accomplishment in the field of chemica
control of an undesirable species that has destroyed the once valuabl
lake trout resource.

Artificial propagation is being used to restock Lake Superior wit
lake trout. Survival of hatchery-planted trout is excellent an
growth rapid, indicating a promising future for rehabilitating th
lake trout fishery. Spring plants of fish were found to be much mor
productive than autumn plants.

The continued development of the commercial trawl fishery fo
underutilized and unutilized species in Lake Michigan was assisted b

he exploratory fishing cruises of Bureau charter vessels. These fforts revealed that commercial quantities of bloater chubs were avail-ble to otter trawls at various localities in the southern part of the ake from Ludington, Mich., to Sturgeon Bay, Wis.

### *Atomic Energy*

The Bureau was interested in several applications of atomic energy. A program on low level radiation of seafoods began at the Bureau's Gloucester Technological Laboratory under contract with the Atomic Energy Commission. The objective of this work is to determine the effect of pasteurization levels of radiation on the nutritive value and acceptability of unfrozen clam meats and haddock fillets.

A radiobiological consultant program was developed to advise the AEC, the States, and other agencies on the effects of atomic effluents on commercially valuable marine species. The effect of traces of radioactive materials discharged into the sea is becoming increasingly important in view of the rapid expansion of industrial uses of atomic energy.

At the request of the Office of Isotopes Development of the AEC, a study was made to determine the conditions under which radiation-processed fishery products should be marketed in order to provide the greatest overall benefits to the fishing industry and to the consumer. The AEC has found the published report to be valuable for planning research and educational programs.

### *Pesticides*

The increasing use of pesticides to control undesirable plants and insects has resulted in adverse effects on desirable birds and animals. The Bureau recognized that adverse effects might also occur to commercial fish and shellfish from chemicals leaching into the water and eventually reaching the bays and estuaries. Laboratory experiments were begun in 1959 to accumulate basic knowledge of the effect of pesticides on the commercial marine species and their environment. These have disclosed that a few parts of some pesticides per billion parts of water can be harmful or lethal. Particularly sensitive are the young stages of shrimp and bivalves and the planktonic organisms on which they feed.

Studies are continuing to evaluate all common pesticides and will provide necessary information for field studies and technical advice for spraying programs in the future.

## Fish Protein and Oils

The breakdown in the quality of fish after capture has always be a problem to the fishing industry. Recent research by Bure scientists has been directed towards the causes of this breakdow which results in off flavor and toughening of the flesh. It has be found that the deterioration in quality is caused partly by the f acids in the flesh reacting with the flesh proteins. The discove and understanding of this interaction brings the problem much clos to solution.

The research program on fish oils has advanced significantly. new analytical technique has been developed to separate the many fat substances in fish oils. Now, specific groups of compounds in fish oi can be isolated for further analyses and identification. This is important advance, for undoubtedly many industrial uses can found for the various specific compounds yielded by the oil.

## Fish Meal

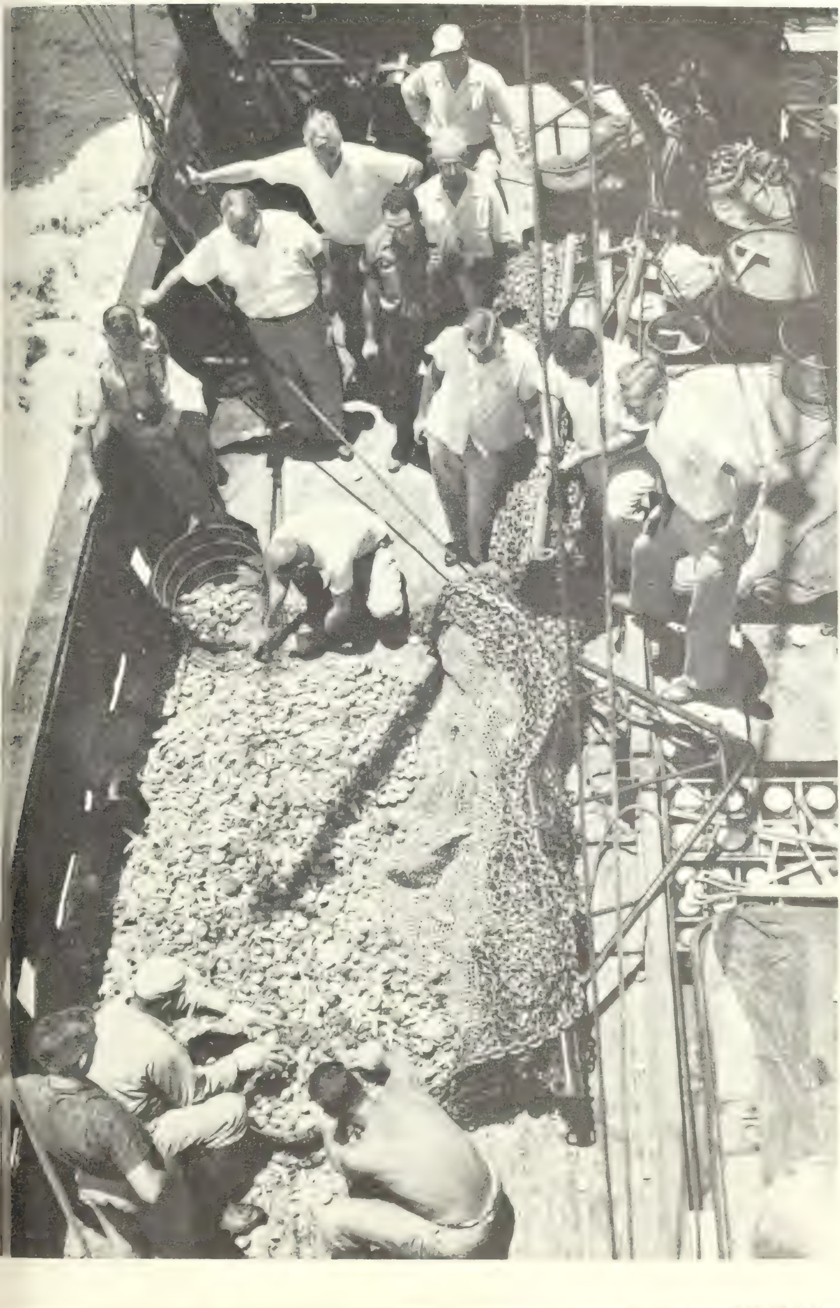
The increasing use of industrial fishery products as protein su plements for animal feeding has stimulated the Bureau's researc studies on fish meals. Results of feeding studies in which vario fish products were added to the food indicated wide variations in t nutritive value of the different products fed.

Further research revealed that most variations in the nutritive val of fish meal were caused by differences in the raw material used an changes that occurred during processing and handling. With th information, fish meal producers will be able to modify processin techniques and produce fish meals with much less variation in nutritiv value. This standardization will be an attraction to producers o animal feed mixtures.

## Exploratory Fishing

The research vessel *John N. Cobb* located bottom-fishing grounds i areas off the Pacific coast where commercial fishing had not bee carried on because the bottoms were considered too rough for trawling In the "spit" area west of Cape Flattery, Wash., commercial quantitie of groundfish were found in four separate areas. Catches were domi nated by petrale sole, Dover sole, Pacific ocean perch, and othe rockfish.

Information on these findings were released immediately to th fishing industry, and, as a result, 1.2 million pounds of fish wer



*Immense beds of calico scallops were found during the year by Fish and Wildlife Service exploratory fishing vessels off the coast of North Carolina and the east coast of Florida. In one place commercial concentrations were found over an area of 1,200 square miles.*

caught on the new fishing grounds. Additional suitable trawlin grounds were located off the northern end of Vancouver Island.

Exploratory bottom trawling by the Bureau's research vessel *Orego* off the coasts of Louisiana and Texas provided valuable information o the availability of industrial fishery stocks in that area. During summer the best catches were made between Ship Shoal and Galveston i less than 10 fathoms. During autumn commercial quantities of fis were found between Ship Shoal and the Mississippi Delta in 10 t 20 fathoms and on Sabine Bank in less than 10 fathoms. Catches a high as 6,000 pounds per hour were made.

A calico scallop fishery has developed on grounds off North Carolin and the Florida east coast. The Bureau has continued to give it assistance to this new fishery of great potential importance. Furthe cruises of the exploratory fishing vessel *Silver Bay* resulted in th discovery of additional grounds. Demonstration cruises aboard th vessel helped acquaint industry members with harvesting techniques

### *Fishing Gear Studies*

Two methods of increasing the efficiency of the fisheries are to develop better types of fishing gear and to provide better materials fo the present gear.

In recent years, midwater trawls, a new type of gear, have bee developed to operate in the mid-depths of the sea where great quantitie of fish are found. Research on these trawls continues, because thei design needs to be perfected and the technique of using them refined Recent research has produced several advances. By using electroni instruments developed for evaluation of midwater trawl designs, i is now possible to determine the exact position of the trawl above th sea bottom. Trace recordings of the fish being caught can now b made. The use of such instruments should improve the efficiency o midwater trawls considerably.

Preliminary comparative fishing tests by the Bureau's research vessel *Delaware* indicate that some types of otter trawl fibers not no used by the New England fleet might result in increased fishin efficiency.

### *Economic Studies*

Economic trends within the fishing industry were investigated b studying the relationship between the prices paid to fishermen for thei catches and the prices fishermen must pay for goods and service purchased. The statistical examination of the indexes of employmen and financial conditions within the industry continued.

The increasing costs of transporting fish and fishery products have ious effects on profitable marketing; consequently, transportation idies are necessary to determine how more efficient and less costly ipping procedures may be followed and how further added costs y be avoided. A study of exempt trucking of fish and shellfish is completed, and two other research studies on transportation were gun. The Bureau prepared and sent to transportation regulatory encies several petitions concerning fair transportatioin rates for h.

## esearch Grants and Fellowships

To encourage basic research and graduate training in fisheries ience, a new program of grants and fellowships was initiated. A ant of $10,000 was made to the University of Washington for basic search on oyster pathology. The University of Rhode Island was ranted $25,000 for a pilot study of an Aquatic Science Information etrieval Center. The University of Miami received $5,500 for a llowship to be granted to a graduate student in marine science.

# Construction

Completion and occupancy of new laboratory buildings at Auke ay (Juneau), Alaska and Oxford, Md., an aquarium-storage buildng at Woods Hole, Mass., and a recirculating sea-water laboratory Galveston, Tex., represent the first phase of a building construction rogram planned to provide adequate, up-to-date facilities for biological research.

The Auke Bay laboratory will provide facilities for basic research n Pacific salmons, herring, king crab, and other northern species. he Oxford laboratory is the Bureau's center for research on oyster ortalities and is located on a 12-acre site donated to the Federal overnment by Arthur J. Grymes of Easton, Md.

The aquarium at Woods Hole will permit controlled laboratory xperiments on fish behavior, diseases, and physiology and in addition, ill provide public displays of native marine animals. At the Galeston sea-water laboratory, studies are being made of the life history, iseases, and natural enemies of shrimp and commercial fish and the ffects of insecticides on marine life.

## ew Research Vessel

An oceanographic-fishery research vessel for work in the Atlantic as designed, and a $1.7 million contract was awarded for its con-

*Another step in the long campaign to get answers to many of the biological prob lems which beset shellfish in the Middle Atlantic States was the construction of th Fish and Wildlife Service Biological Laboratory at Oxford, Md.*

struction. It will be one of the first vessels constructed under th new national oceanographic program endorsed by the President an will be the first stern-chute trawler built in the United States an operated from a North American port—Woods Hole, Mass. Thi new 187-foot vessel will enable Bureau scientists to intensify thei studies of the oceanic resources so important to the fishing industry

## *Marketing Services*

In addition to its research activities, the Bureau makes a larg effort to provide the fishing industry with a variety of services tha have immediate as well as long-range benefits. These services includ such activities as standards development, fishery-products inspection advice to cooperatives, market promotion, production of motion pictures and publications to promote fishery consumption, fish-cooker demonstrations, statistical surveys, and distribution of daily an monthly reports on fishery activities. These activities help the industry to promote the expanded use of its domestic fishery products

## *ndards Development and Inspection*

nder the standards-development and inspection program, 6 new cessing plants subscribed to the inspection and certification service, king a total of 42 plants now operating under the Bureau's quality-rance program. A total of 10 fishery-product standards are now ng applied to products by 48 Government-trained inspectors. Over million pounds of fishery products in 17 states were inspected and tified by these inspectors during the year. Assistance in procuring h-quality seafoods is also being provided to State organizations.

orty-four fishery cooperatives were inspected for compliance with tions 1 and 2 of the Fishery Cooperative Marketing Act of 1934. operatives in Alaska, Florida, California, Louisiana, Maine, and ryland were given technical advice and assistance on a variety of ganizational and management problems.

## *rket Promotion*

he New England sea scallop industry requested marketing assist- ce because it was faced with depressed prices and heavy inventories, sulting from sharply increased imports and record domestic land- gs. A cooperative "all out sales push" was organized, and the scallop rket was considerably strengthened.

Efforts were continued to develop markets for underutilized fish. sh use in the pet-food and mink-feed industries has been steadily creasing over the past few years as a result of industry followup of reau market-development activities. This is aiding a number of pressed fishery industries, particularly in the Great Lakes area.

Assistance was given to Arkansas fish farmers who were having fficulties in marketing buffalofish produced in flooded rice acreage. marketing specialist and a fishery products technologist were de- iled to assist the industry. The market demand for buffalofish was creased significantly as a result of their efforts.

Consumer-education materials were distributed to newspaper and agazine food editors, radio and television food personalities, public- rvice directors, and extension specialists, as well as to the mass-feed- g industry and the retail food trade. Several special promotional rograms with agricultural commodities were developed, such as fish nd lemons, fish and cranberries, and fish and olives.

## *ovies and Demonstrations*

Nineteen Bureau-produced, and for the most part industry-financed, shery educational motion pictures are now in national distribution

*Home economists and marketing specialists of the Fish and Wildlife Service appe on many television homemaker shows annually.*

through some 180 cooperating film libraries and Government distribution channels. These films have an annual viewing audience in exces of 2 million persons, exclusive of public-service television showing An industry-financed motion picture completed during the yea Sponge-Treasure From the Sea, was awarded a "certificate of participation" at the American Film Festival. Salmon—Catch to Car another industry-financed motion picture, was honored by "selectio for showing" at the 1960 International Film Festival in Edinburgh Scotland.

The Bureau cooperated with State and Federal vocational education officials in conducting Retail Quality and Merchandising Workshops in Philadelphia, Pittsburgh, Boston, New York, and Baltimore These workshops demonstrated techniques for selling more fish provided specialized instruction in proper fish handling method to avoid quality loss; and demonstrated modern merchandising.

Bureau home economists presented 243 fish-cookery demonstration for approximately 14,000 school and other institutional food-preparation personnel. They also appeared on numerous television and radio ood shows, participated in five national food trade conventions, and leveloped and distributed kitchen-tested recipes for institutional and omemaker use.

## *tatistical Studies*

During the year, general statistical surveys to obtain detailed data n employment in the fisheries, the number of fishing craft and gear perated, volume and value of the catch, and the production of manuactured fishery products for 1959 were completed and published for ll sections of the United States. Similar surveys were undertaken or 1960.

Monthly bulletins on landings of fish and shellfish in 19 States were ssued. Publication of monthly landings for Michigan, Minnesota, nd Wisconsin was started during the year. As a result of the addiion of these landing bulletins, monthly information became available n over 98 percent of the domestic catch of fish and shellfish.

A sharp decline in the prices of fish meal and solubles showed the eed for information on the past history of this industry. Several ublications were issued on U.S. production and imports of fish meal nd scrap and U.S. foreign trade in fish and marine animal oils. lso, arrangements were completed during the year to cooperate with he International Association of Fish Meal Manufacturers in London n assembling data on the production of fish meal, solubles, and oil.

## *Market Reports*

The Fishery Market News Service provides the fishing industry vith current information on landings, receipts, prices, demand, maret, stocks, imports and exports, and new developments in domestic nd foreign fisheries in order to aid in the orderly marketing of ishery products and byproducts.

From the market information furnished by the daily Fishery Products Reports members of the industry can estimate the current narket for fresh, frozen, and canned fishery products. These reports re issued by seven Market News Service offices located at Boston; New York; Hampton, Va. (includes data from Baltimore); New Orleans; San Pedro; Seattle (includes data from Astoria, Oreg.); nd Chicago.

Information transmitted by the Department of State from foreign eporting posts is published in the daily Fishery Products Reports nd the monthly Commercial Fisheries Review. This monthly peridical, in its 23d year, features articles and news of trends and levelopments in the domestic and foreign fisheries.

## *Financial Assistance*

The Fisheries Loan Fund Program continued to aid the fishin industry. New applications for 184 loans, totaling $4,718,050 wer received during the year. The backlog of cases being processed o deferred at the request of the applicants was 22 at the beginning o the year and 32 at the end of the year. Ninety-four applications wer approved for $2,247,000, and 72 for $1,603,000 were declined or foun to be ineligible. Nineteen applications were withdrawn by applicant before final decisions were reached. Collections of principal an interest totaled $1,430,000 during the year.

These loans were made for financing and refinancing the operation maintenance, repair, and replacement of equipment, fishing gear, an vessels. Most fishing vessel owners have been unable to obtain financing from other sources because of the depressed condition of th fishing industry. The catch of the vessels receiving loans from thi program totaled an estimated 240 million pounds in fiscal year 1961 The increase in landings resulted largely from tuna catches by purse-seine vessels converted from clipper (bait) boats.

### *Mortgage Insurance Program*

The Fishing Vessel Mortgage Insurance Program began to attract attention in the last half of fiscal year 1961. Four cases were approved, involving 10 salmon gillnetters for use in Alaska, 1 shrimp vessel in Florida, and 2 trawlers in Massachusetts.

One application was received for a subsidy under the new Fishing Vessel Construction Subsidy Program which was authorized by Public Law 86–516. The subsidy was requested for the construction of a New England groundfish trawler.

## *Foreign Trade Activities*

A wider coverage of foreign fishery developments is being sought. Increasing competition for world fishery resources and rising imports into the United States have seriously affected important segments of the domestic fishing industry. Information provided from abroad provides a basis for the Bureau's actions to assist the U.S. fishing industry to solve the problems of import competition and export restrictions. Moreover, the U.S. fishing industry has increased its demands for more information to meet competition in home products and to determine investment and marketing opportunities abroad.

At the request of industry, the Bureau conducted short market rveys in certain underdeveloped countries to determine the prospects r increased fish consumption and the possibilities for exports of .S. fishery products.

In collaboration with the Department of State, a new regional shery attaché post was established in the American Embassy, Copenagen, to cover the European area. With posts already operative in atin America and in Japan, there are now three specialized fishery ficers in the Foreign Service. Additional steps were taken during e year to improve fishery reporting from U.S. embassies and conlates located in important fishing nations. A survey was made of e fishery reporting programs at several U.S. diplomatic posts in urope, and technical guidance was provided to the officers assigned fishery reporting.

### *ariff Negotiations*

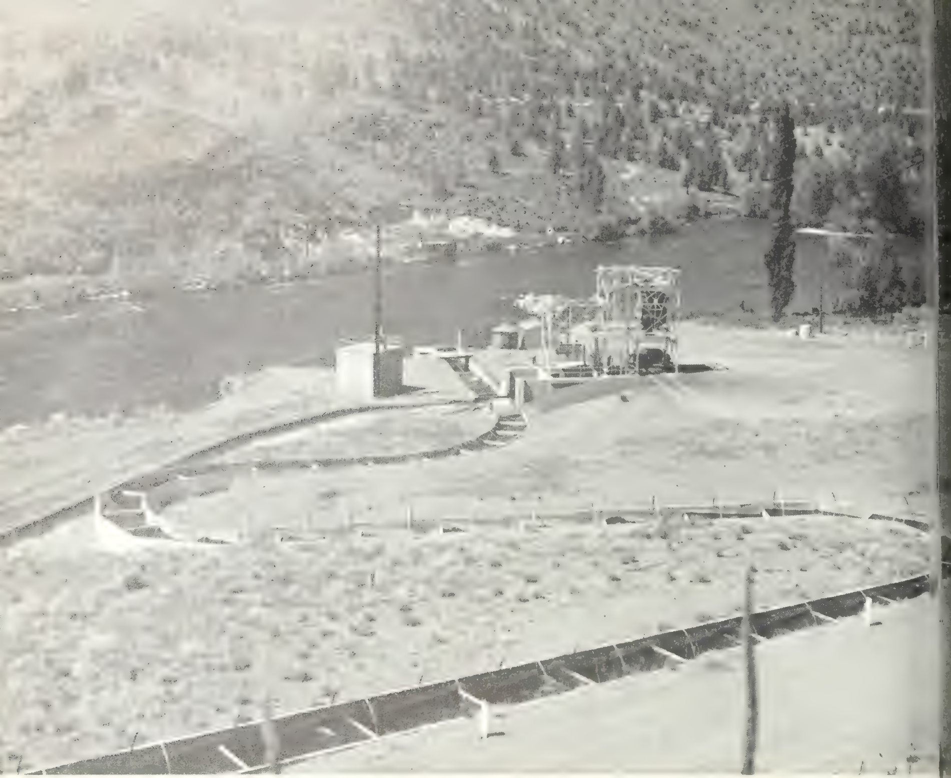
In September 1960, the United States and other members of the eneral Agreement on Tariffs and Trade (GATT) entered into riff negotiations with members of the European Economic Comunity (Common Market). A specialist in fishery trade matters as placed on the U.S. delegation to these negotiations to advise on e technical aspects of the fishery items under consideration.

The Bureau participated in the proceedings of a Working Party f the Organization for European Economic Cooperation (OEEC) aling with fish-marketing problems in European countries and with eans of eliminating trade barriers. The results of these meetings ere published.

### *ish Meal Promotion*

The Bureau participated in the International Meeting on Fish eal, held by the Food and Agriculture Organization of the United ations in Rome. The purposes of this meeting were to assess the orld demand for fish meal, to consider ways of increasing the deand, and to explore possibilities of ensuing stable conditions in the ternational market for fish meal.

Several facts became evident at the meeting. First, there are large ocks of fish which are relatively unexploited; second, the long-range oduction of fish meal depends upon demand rather than supply; ird, there is a pressing need for research leading to the development and use of fish flour for human feeding. The proceedings of e meeting were published and distributed widely.



*Dams and other obstructions which prevent anadromous fish such as the salm*
*from migrating upstream to their ancestral spawning beds can be partially met*
*some places by fish traps and ladders such as the one shown above on the Deschu*
*River in Oregon.*

Increased attention was given to matters of foreign aid to assu that domestic fishing interests were adequately represented in U. programs for economic and technical assistance to the fisheries lesser developed countries.

## *Columbia River Fishery Program*

Water resource development in the Columbia River Basin, partic larly hydroelectric power generation projects, continues to prese serious problems to the successful maintenance of the migrato salmon and steelhead resources.

The Columbia River Fishery Development Program, a cooperati venture with the State fish and game agencies of Washington, Orego and Idaho, and the two Bureaus of the Fish and Wildlife Servic has continued under Federal financing. This program consists operation of hatcheries, screening of water diversions, and strea improvement activities such as providing fish ladders at fall and r moving log and debris jams.

*his experimental salmon incubation channel is part of a vast program being con-*
*cted by the United States and the States of Washington, Oregon, and Idaho to*
*store the salmon fishery of the Columbia River.*

To date 21 hatcheries have been constructed or remodelled, several
ndred screens have been emplaced, over 1,200 miles of stream have
en improved, and 21 major fishways have been constructed. Newly
veloped facilities for passing adult upstream migrants and juvenile
wnstream migrants are now in operation at some high dams on
portant tributary streams. Their success, however, cannot be de-
rmined until the adults return over a period of several years. In
der for the facilities to be successful, they must sustain the runs at a
vel which will continue to support the existing valuable fisheries.
uring the year, a program of operational studies was initiated to
udy methods for improving production techniques, including arti-
ial propagation.

The objective of the fishery development program is the full de-
lopment of areas still available to salmon and steelhead to compen-
te, in part, for damages to the fishery resource resulting from the
ederal water development program in the Columbia Basin.

One of the greatest threats to the runs is the construction of one or
ore high dams in the Middle Snake River area in the vicinity of the
nfluence of the Salmon River. The magnitude of the runs which

pass through this section of the river is approximately 40 percent
the spawning escapement in the Columbia River upstream fro
Bonneville Dam.

Consequently, projects which affect these runs will have far reachir
effects upon the entire fishery resource. To find a satisfactory sol
tion to the problem of fish passage at high dams, the Department wit
the concurrence of the President, has decided upon an accelerated r
search program, to be initiated before July 1961.

## *Fur Seal Resource*

During the summer of 1960, the Department, as administrator
the United States fur seal industry, took 40,616 sealskins on th
Pribilof Islands, Alaska. Under the terms of the Interim Conventio
on Conservation of North Pacific Fur Seals, Canada and Japan eac
received 15 percent of this take plus 375 skins.

Sales of United States-owned sealskins during the fiscal year 196
included 59,550 skins with gross receipts to the United States of $2.
million. Under the terms of the Alaska Statehood Act, 70 percent o
the net proceeds from the sale of sealskins shall be paid to the Stat
of Alaska. Based on proceeds during fiscal year 1960, the secon
annual payment to the State was over $1 million.

# Office of the Administrative Assistant Secretary

D. Otis Beasley, *Administrative Assistant Secretary*

The Administrative Assistant Secretary in discharging the duties of the Secretary for administrative management directs and supervises seven staff divisions: administrative services; budget and finance; inspection; management research; personnel management; property management; and security.

## *Administrative Services*

The Division of Administrative Services has primary staff responsibility for all administrative services activities of the Department. A number of specal activities and accomplishments include increased usage of the Department's Central Library by approximately 7 percent and the installation of automatic audiovisual projection equipment for both slides and motion pictures in the Department museum. During the year the museum became an accredited member of the American Association of Museums. Visitation to the museum increased to more than 70,000 during the fiscal year. Installation of an automatic short-run collator in the central duplicating plant eliminated much of the handwork previously necessary on multipage material.

## *Budget and Finance*

The Division of Budget and Finance which has primary sta responsibility for the budget and finance activities of the Departme placed increasing emphasis on systems improvements and special effo was directed to installing accrual accounting systems in the Bureau Commercial Fisheries and Office of the Secretary.

A statement of basic principles and concepts was developed for th integrated accounting system of Geological Survey. Assistance wa provided the Bureau of Land Management in the mechanization the payroll system in the Washington office, and in the installation automatic check endorsing machines in the larger land offices.

The Division also continued to work with the Department's Na tional Park Service, Bureau of Land Management, Bureau of Com mercial Fisheries, Office of Territories, and Office of the Secretar in the documentation in manual form of their accounting systems fo submission to the Comptroller General.

During the year, the Division reviewed and took action as necessar on 68 General Accounting Office audit reports, of which 28 were Con gressional audit reports and 40 were Bureau and Letter audit report In addition, action was taken as necessary on 134 internal audit report rendered by bureaus of the Department.

Two regular budgets were processed for the Bureau of Reclamatio and power marketing agencies and for the other bureaus, in additio to three supplemental appropriation budgets. The Division devel oped forms and procedures designed to provide the Secretary an Assistant Secretaries with summary budget information from whic policy decisions could be made on the magnitude of programs to b included in the Departmental budget. Work continued on improvin budget justifications submitted to the Bureau of the Budget and t the Congress, and on coordinating the Bureaus' budget structure wit their organizational patterns.

## *Inspection*

The Division of Inspection is responsible for the inspection an special investigative activities of the Department. The necessity fo inspection program is to insure high ethical standards in the manage ment and administration of the Department's affairs.

Upon the issuance of Executive Order 10939, May 5, 1961, "T Provide a Guide on Ethical Standards to Government Officials, existing memoranda were modified and new instructions to implemen the provisions of the Executive Order were promulgated and dis tributed to employees.

The Division of Inspection also has responsibility for Depart-
ental handling of matters under the Government's Equal Employ-
ent Policy enunciated in Executive Order 10925, March 6, 1961.
epartmental policies have been revised as advocated by the Presi-
nt's Committee on Equal Employment Opportunity. A survey has
en completed to determine the number of minority employees on
epartmental payrolls, and surveys are proceeding to cover a case
case analysis of employee records of Negro employees in the De-
rtment. A review of college recruitment practices and the assem-
y of a descriptive statement concerning all such employment
actices is also being conducted.

### *anagement Research*

The Division of Management Research is responsible for improve-
ents of the general management and organization throughout the
epartment.

During the past year, the Division has participated in a number
management studies and provided management research and as-
stance in a variety of projects. The following are examples of the
ghly diversified nature of these projects:

- Survey of engineering design and construction practices of the epartment.
- Reorganization studies of the Bureaus of Mines and Land Man- gement.
- Review of the present organization of the Department to fulfill s civil defense and other emergency planning responsibilities.
- Preparation of organization and delegation statements for the w Office of Coal Research.
- Inventory of bureau management analysis activities and partici- tion in a study of management practices among the executive agen- es of the Federal Government sponsored by the Bureau of the udget.
- Collaboration with the Bureau of the Budget in reviewing proce- ures for the programing and coordination of Federal surveying and apping activities.

The Division administered a system for the preparation, review and
uance of Secretarial directives. More than 200 documents were
ocessed for Secretarial action. Of these 113 were Federal Register
cuments; 74 were Departmental Manual releases; and 15 were pro-
osed Presidential documents. In addition, the Division has acted as
ordinator for the Department on committee-management policies,
ocedures and methods, and provided leadership on paperwork-im-
ovement efforts of the Department.

Under the Incentive Awards Program the Department of the Interior showed a slight decrease in the number of suggestions receive per 1,000 employees. However, the adoption rate for the 1961 fisca year was 36 percent, as compared with 31 percent for the last fisca year. The average individual awards made for suggestions or inventions also increased from $33.67 to $34.09. Superior performanc awards still hold at about the same average. Special Acts or Service Awards increased by 41 percent.

The following statistics reflect the 1961 activities of the incentiv awards program:

| *Cash Awards* | | *Honor Awards* | |
|---|---|---|---|
| Suggestions | 1, 637 | Distinguished service | 4 |
| Superior performance | 1, 259 | Valor awards | |
| Special acts or services | 165 | Meritorius service | 12 |
| | | Commendable service | 53 |

## *Personnel Management*

The Division of Personnel Management has primary staff responsibility for the development of policies and programs to establish an maintain an adequate, qualified and efficient working force in the Department.

Major emphasis during the year was placed on improving the Department's career development programs. The training officers of the bureaus were organized into a "Development Committee" to study bureau and Departmental executive development requirements and plans and to coordinate training in the Department.

An executive development agreement with the Civil Service Commission has facilitated the development of scientific, professional and technical employees as administrators and managers. It also has facilitated the training of administrative personnel in other types of administrative and management fields.

Studies were made of career opportunities of engineers and foresters on a Department-wide basis. Greater emphasis was placed on the utilization of student trainees in professional fields and recruitment of more well-qualified college graduates for entrance-level administrative positions. A simplified examining procedure was established, bureau board programs were strengthened, and greater coordination of the examining program was achieved.

Cooperation and assistance have been given to the Civil Service Commission on proposed classification standards for 16 series and to the bureaus in developing and preparing drafts of proposed standards for positions in three series peculiar to the Department. Assistance

was also given to the Civil Service Commission on drafting regula-
ions on conduct and appeals of adverse actions.

In the field of safety, progress was made in taking accident preven-
ion out of the extra curricular activity of working assignments and
naking it an effective integrated working tool of everyday manage-
nent. In the face of rising employment, the Department rate of
lisabling work injuries continued to decrease and the rate in fiscal
961 was the lowest since 1945.

During the year the pamphlet Careers in the U.S. Department of
he Interior was revised and published and a pamphlet on retirement
ounseling was developed and issued.

### *roperty Management*

The Division of Property Management has primary staff responsi-
ility for all property management activities of the Department.

Contracting and purchasing policies of the Department were revised
luring fiscal 1961 to provide more direct contracting activity in areas
f labor surplus, and to protect the Department against identical bids
mong suppliers.

A comprehensive study of all documents reflecting business trans-
ctions between the Department and nongovernmental organizations
nd individuals was initiated to conform with the President's ex-
anded Equal Employment Opportunity Program.

Continuing progress was recorded in reduction of housekeeping
nventories, increased utilization of excess property, and in the train-
ng and orientation of employees assigned to property management
unctions.

Department policies for screening real property no longer needed
y bureaus or offices were revised to promote more effective utiliza-
ion of such property within the Department.

During the year, personal property acquired at a cost of more than
850,000, but no longer needed in the Department, was donated to
ublic schools and hospitals through the donable property program,
dministered by the Department of Health, Education, and Welfare.
pproximately 54,000 square feet of filing space was released through
lisposing of records no longer needed for current business.

The Division continued to represent the Department on the inter-
lepartment radio advisory committee which, in collaboration with the
ederal Communications Commission, prepared a U.S. proposal on
requency allocations for Space Service radiocommunication. Man-
al releases and technical studies were made to provide for, or im-
rove the radiocommunications services of the bureaus and offices

Over 800 radio frequency assignments were issued, including a numbe due to conversion to narrow-band frequency modulation type o operation and bureau reorganizations.

### *Security*

The Division of Security has primary staff responsibility for th establishment and maintenance of security throughout the Department. The Division also has a special assignment for Departmenta direction and coordination of the radiological defense trainin program.

The status of physical security measures at key facilities of th Department of the Interior, continue to receive attention. Securit measures have been implemented and the personnel security progran continues without any substantial change.

The radiological defense capability of the bureaus and offices o the Department has advanced at a highly satisfactory rate. At th close of the fiscal year, approximately 2,000 employees had beer trained in radiological defense. In addition, the Department ha established monitoring capabilities at some 265 stations in the federa fixed station monitoring network which is under the jurisdiction o the Office of Civil and Defense Mobilization. These stations are al dual purpose; they are regular installations of the Department o the Interior, and likewise serve in the federal network.

# Office of the Solicitor

## Frank J. Barry, *Solicitor*

The Number of matters considered in the Office of the Solicitor reached an all-time high of over 148,000. In addition, more than 30,000 hours were spent in the giving of oral advice and at the attendance of conferences and meetings. A record number of 480 appeals in land cases were received.

In connection with the establishment of the Department's Office of Coal Research, pursuant to the Act of July 7, 1960 (74 Stat. 336), and the initiation of the programs of that Office, counsel and advice was rendered.

Loan agreements, contracts of loan insurance, contracts of mortgage nsurance and preferred ship mortgage forms were prepared for use by the Department's Bureau of Commercial Fisheries in connection with its fishing vessel mortgage insurance program. In each program area, the first loan was closed with the assistance of the Solicitor's Office.

Two certification forms on noncollusive bidding were adopted by he Department for inclusion in invitations for bids. One is for use n invitations for bids on materials, supplies, and equipment and the other is for use in construction, alteration and repair bid invitations. Procedures were devised for rejecting identical bids and, where necssary, readvertising or negotiating.

A revised guaranty clause was developed for use in major supply ontracts. The revised clause makes fitness for intended use an express warranty, take cognizance of defects in design and condition as well as defects in materials and workmanship, and exempts latent defects from the stated limitation period within which claims for breach of warranty may be made.

A member of the Solicitor's staff represented the Secretary in proceedings before the Federal Power Commission *In the Matter of South Carolina Electric & Gas Company*, Docket No. E–6468. This proceeding is under section 10(f) of the Federal Power Act (16 U.S.C. 803(f)) to determine (1) the benefits received by the company's downstream Stevens Creek project from the Federal upstream Clark Hill project, and (2) the assessment which should be paid by the company on account of such benefits. This is the first case under that section of the Act involving a Federal project to reach the hearing stage.

A new type of contractual arrangement for the sale of federally generated peaking power was developed during the fiscal year. The agreement permits the Arkansas Electric Cooperative Corporation to pool thermal peaking power with that purchased from the Department's Southwestern Power Administration and by means of a system integration between the Government and a private utility to assure continuous service for members and customers of the Cooperative.

In connection with the Canadian River Reclamation project, Tex., the first large all-municipal water-supply project to be constructed by the Department's Bureau of Reclamation, extensive legal assistance was given by members of this Office in the preparation and execution of a repayment contract with the Canadian River Municipal Water Authority and supporting contracts between the Authority and 11 member cities.

On October 28, 1960, the United States Court of Appeals for the Tenth Circuit held that the Secretary of the Interior had no authority to cancel administratively Federal oil and gas leases obtained by fraud (*Pan American Petroleum Corporation* v. *Ed Pierson, et al.*, 284 F. (2d) 649). At the close of the fiscal year the Davis and Featherstone contests were being held in *status quo* pending consideration of the above case.

Extensive work was done in connection with development of the permit program designed to bring under control the trespasses of long standing on the lower Colorado River.

Among the decisions rendered by the Board of Contract Appeals, one of particular importance is *Merritt-Chapman & Scott Corporation* (68 I.D. 1). This appeal presented the issue whether the prime contractor for the construction of Glen Canyon Dam on the Colorado River was entitled to additional compensation from the Government, under an escalation clause in the construction contract, on account of increased labor costs resulting from new union labor agreements negotiated after the work had started. The Board held that the increases in pay provided for in the agreements were wage increases, to which the escalation clause applied, rather than subsistence or travel allowances, to which the clause did not apply. The amount of the additional compensation payable over the life of the construction contract pursuant to this determination is estimated as being in the neighborhood of $5 million. At the close of the fiscal year a motion by the Government for reconsideration was pending before the Board.

In *Layne & Bowler Export Corporation* (68 I.D. 33), the Board of Contract Appeals held that a delay caused by the fault of a subcontractor was not excusable, irrespective of whether the prime contractor was also at fault, even though the subcontractor was a second-tier rather than a first-tier subcontractor. While previous decisions of the Board had pointed towards such a strict view of the contractor's responsibility for his subcontractor's conduct, this was the first decision in which the Board expressly repudiated the contrary view adopted some years ago by the Armed Services Board of Contract Appeals.

# *Resources Program Staff*

## Charles H. Stoddard, *Director*

The Resources Program Staff provides assistance to the Secretary the Under Secretary, and the Assistant Secretaries on national program matters, in policy planning and coordination, and at the regional level through its six Field Committees, and inter- and intra-agency coordination of resource management operations.

The Resources Program Staff also performs liaison functions for the Department of the Interior with the Outdoor Recreation Resources Review Commission, the Department of Agriculture, the State Department, the Department of Health, Education, and Welfare, Department of the Army, and with various other agencies in related spheres of resource conservation and with related responsibilities in resource management.

In discharge of these assigned responsibilities, the Resources Program Staff furnished Departmental representation and presented coordinated Departmental positions for the GATT (General Agreement on Tariffs and Trade), working specifically with Committee III which dealt with the problem of expansion of trade of less developed countries, and with the Working Party on Market Disruption seeking an internationally acceptable method of dealing with disruption of a given market through the sudden increase of imports.

Through fiscal 1961, the Resources Program Staff continued its activities of arranging for official visits to the Department of foreign dignitaries and officials, scientists, and students interested in exchange of information. It maintained liaison with the Inter-Agency Committee on Water Resources, the Atomic Energy Commission, the National Science Foundation, the Office of Statistical Standards, Bureau of the Budget, International Cooperation Administration, and with other Federal agencies on program matters of mutual concern.

As part of its planning function, the Resources Program Staff developed the report and outlined a plan for land use in the Lower Colorado River Valley.

In continuance of its coordinating activities with Outdoor Recreational Resources Review Commission, the Resources Program Staff compiled material and presented the Departmental position through its participation in the Third Joint Meeting of the Commission at Jackson Hole, Wyo., July 29–August 2, 1960.

With the advent of the Kennedy Administration, greater emphasis has been laid upon program planning functions, and the Staff has become more actively involved in the affairs of the Department in an advisory and planning role, while continuing its coordination and liaison functions.

In its staff advisory capacity, the Technical Review Staff has engaged in the collection and compilation of background material as well as the preparation of reports and draft proposals concerning many topics, including outdoor recreation, water resources planning, resources investment potentials, employment and effects of resource development.

The Staff has prepared testimony and background material for use before committees of the Senate and House of Representatives in behalf of legislation for the establishment of a Youth Conservation Corps, for the authorization of a National Fuels Study Commission, for enactment of the proposed Water Resources Planning Act of 1961, and other resource matters.

The Resources Program Staff represents the Department in coordination of activities delegated by the Secretaries of Commerce and Labor, under the Area Redevelopment Act, Public Law 87–27, and in he development of overall economic development projects both for Indian reservations and other depressed areas where resource development is adaptable for redevelopment purposes.

# *Oil Import Administration*

**J. Cordell Moore,** ***Administrator***

The Secretary of the Interior, pursuant to Presidential Proclamation 3279, dated March 10, 1959, established the Oil Import Administration within the Department and issued regulations for the operation of an oil import program.

The objective of the oil import program is to insure a stable, healthy petroleum industry within the United States capable of exploring for and developing new domestic petroleum reserves.

In administering the program, the Oil Import Administration:

1. Analyzes data prepared by the Department's Bureau of Mines relating to petroleum demand in the United States, by commodity type and petroleum districts, in order to set the overall amounts of crude and unfinished oil, and finished petroleum products to be allowed into the United States and Puerto Rico.

2. Establishes equitable semiannual oil import allocations for individual eligible oil importers by product type and district, other than residual fuel oil (which is on an annual basis), and issues import licenses.

3. Analyzes monthly reports from each importer showing the amount and disposition of petroleum imports entering the Nation under license and issues public reports concerning the oil import situation and the administration of the program.

4. Analyzes all exchange agreements of foreign crude and unfinished oils and domestic crude and unfinished oils.

5. Issues letter authorization to Collector of Customs to permit entries without an import license of small quantities of crude oil, unfinished or finished products.

6. Responds to an increasing volume of requests for information concerning the administration of the program from Congress, the press, foreign governments, other governmental agencies, and the public.

## *Summary of Activities*

During Fiscal Year 1961, the Oil Import Administration issued 1,791 licenses for importation of crude petroleum and its derivatives to eligible importers according to commodity type.

Prior to the close of the fiscal year, the Administrator announced overall oil import levels for the allocation period July 1, 1961, through December 31, 1961, and issued individual oil import allocations to 174 eligible importers, for crude oil and finished products other than residual fuel oil to be used as fuel. For the allocation period April 1, 1961 through March 31, 1962, individual import allocations were issued to 43 eligible importers of residual fuel oil to be used as fuel.

In order to administer the oil import program more effectively, the allocation period for residual fuel oil was changed from a quarterly to an annual basis effective April 1, 1961.

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# 1962 *Annual Report*

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*For the Fiscal Year Ended*
*June 30, 1962*

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THE SECRETARY OF THE INTERIOR
WASHINGTON

DEAR MR. PRESIDENT: Transmitted herewith is the 1962 annual
port of the Department of the Interior.

In your conservation message to the Congress in March 1962 and
ain at the White House Conference on Conservation you emphasized
at the continued availability of our life-sustaining natural resources
ust depend on our using them prudently, improving them wisely,
d where possible, restoring them promptly.

Since January 1961 this Department has been instrumental in the
complishment of milestone conservation gains. These standout
ins, advanced by a farsighted Congress, are the first chapters in
eeting this Administration's goal of providing a conservation record
the 1960's worthy of the two Roosevelts.

Reflected in this summary of Departmental activities are the
nificant results now being achieved in the protection and develop-
ent of our priceless resources of land and water through programs
r which the groundwork was laid with the beginning of this
dministration.

We can now indeed see new horizons in conservation progress
hich in the years to come will help to assure our continued security
d progress as a nation.

Sincerely yours,

Stewart L Udall
*Secretary of the Interior.*

HE PRESIDENT,
*he White House.*

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# *Part I*

# *New Horizons in Resource Conservation*

# *New Horizons in Resource Conservation*

Three times in this century—at intervals spaced some 30 years part—America has faced a grave threat to the abundance and dequacy of its natural resources—and consequently to the future of he Nation itself.

On each occasion, the necessary strong hand of leadership has been ound to meet the threat through bold conservation actions—and we ave forged ahead into new eras of progress.

The conservation movement had its beginnings in the early 1900's fter we as a people had waged a ruthless "hundred years' war" on the esources of this continent in the mistaken belief that nature's bounty new no limits. Only a few men—John Wesley Powell, Carl Schurz, ohn Muir and a handful more—recognized the danger signals in the urned forests, the silt-choked streams and disappearing wildlife, ut they found a ready champion in the young President who had just aken office—Theodore Roosevelt.

TR—the first great conservationist President—gathered about im such lieutenants as Gifford Pinchot and moved swiftly to put an nd to the squandering of our national birthright. He provided our orests and water resources with systematic programs of protection, enewal and development and took action to reserve for all of the eople much of the remaining land suitable for forests, parks, and efuges for wildlife.

It was largely on the momentum of this work that we moved forvard in the conservation of natural resources until the 1930's when the reat Depression and the Dust Bowl served unmistakable notice that we were headed again toward resource bankruptcy unless we to further action—and promptly—to repair the damage of the past.

Again—fortunately for America—there was leadership equal to t task. Among the principal programs of Franklin D. Roosevel first term were conservation programs that constituted a massi effort to rescue and reclaim and develop our fundamental resou base of land and water.

Through such action programs as the TVA, the Civilian Conserv tion Corps, the Rural Electrification Administration, and ma others, the threat was averted and a foundation built for futu progress in essential natural resource programs.

Today we face a new crisis affecting the whole broad field of o natural resources—a crisis which, though perhaps not so dramatical apparent to all as that of the 1930's is nonetheless as real a dangerous.

The conservation crisis of the 1960's has resulted neither fro ignorance nor folly, but from our very success as a Nation—the ru of progress symbolized by our burgeoning cities and thriving industr and hastened greatly by expanding population.

## *President Warns of Resource Challenge*

The proportions of the developing emergency were clearly seen b President Kennedy when he took office in January 1961. Only wee later, in a special message to the Congress on natural resources, h spelled them out in these terms:

> "In the resource field, predictions of future use have been co sistently understated. But even under conservative projection we face a future of critical shortages and handicaps. By the ye 2000, a United States population of 300 million—nearly double in 40 years—will need far greater supplies of farm product timber, water, minerals, fuels, energy, and opportunities for ou door recreation. Present projections tell us that our water us will double in the next 20 years; that we are harvesting our suppl of high-grade timber more rapidly than the development of ne growth; that too much of our fertile topsoil is being washe away; that our minerals are being exhausted at increasing rate and that the Nation's remaining undeveloped areas of grea natural beauty are being rapidly preempted for other uses."

The President's message made plain his conviction that a ne conservation effort of Rooseveltian proportions was urgently require to assure an adequate resource base for the future, both immediat and distant.

*hile the first major additions to our outdoor recreational areas in 16 years ring new opportunity to millions of Americans, there still remain significant reas, such as the proposed Canyonlands National Park, which should be reserved for posterity.*

Symbolic of the seriousness with which he views the problem was his all for a White House Conference on Conservation to be held in ashington—the first since the days of Theodore Roosevelt.

## *hite House Conference on Conservation*

Convened in May 1962, the Conference served to pool the talents of 00 leading conservationists from throughout the Nation in a major ew conservation enterprise designed to:

— Exploit science to "create" new resources and enlarge the use of existing resources;

— Give new vigor to traditional programs;

— Increase our vigilance against unnecessary resource waste;

— Unlock the resources of the sea;

— Reserve for their highest human uses the remnants of the American wilderness;

— Establish a land conservation fund to ensure the acquisition of key conservation and outdoor recreation lands;

— Wage an all-out attack on water and air pollution;

— Help cities save open space and plan their growth;

*Established on August 7, 1961, Cape Cod, Mass., became the first seasho area authorized since the 1930's.*

— Grow adequate timber supplies for future needs;

— Save the remaining shorelines for public use;

— Learn to husband fresh water, and to extract it economical from the sea;

— Plan now the water development of all river basins;

— Preserve a viable habitat for waterfowl and wildlife;

— Mount a vigorous campaign—with greatly strengthen State and local participation—to enlarge the opportunities f outdoor recreation;

— Earmark military reservation lands as an ultimate conserv tion reserve for Federal, State and local governments;

— Establish a Youth Conservation Corps to work in the vin yard on most of these problems; and above all,

— Share our conservation know-how and conservation eth with men everywhere.

Actually, the White House Conference reaffirmed, rather tha enunciated, the goals of the Kennedy Administration's aggressiv new approach to the Nation's conservation problems.

The President's clear intention of bending every effort towar achievement of the greatest era, in the conservation history of th

United States had been made evident from the beginning of his term when he wrote in his special message to the Congress:

> "From the beginning of civilization, every nation's basic wealth and progress has stemmed in large measure from its natural resources. This Nation has been, and is now, especially fortunate in the blessings we have inherited. Our entire society rests upon—and is dependent upon—our water, our land, our forests, and our minerals. . . . Wise investment in a resource program today will return vast dividends tomorrow, and failures to act now may be opportunities lost forever. Our country has been generous with us in this regard—and we cannot now ignore her needs for future development."

Acting under the spur of this leadership, the people of the United States—both through the Congress and in independent State and local ections—have joined together in increasing numbers to make possible an unprecedented advance in conservation progress, particularly in the vital area of water resource use and development, and in decisions to preserve, while there is yet time, as much as possible of the outdoor heritage which traditionally has played a deeply significant role in shaping our character and destiny as a Nation.

## *Water Resources*

In any consideration of future resource needs, we are confronted with one basic and sobering fact: assurance of an adequate supply of usable water is rapidly becoming one of the most pressing problems not only in the United States but throughout the world.

Recognition of this fact was clearly emphasized in the President's first special message to the Congress on conservation in 1961; and it was restated in even plainer words in his second resource message this year in which he said:

> "Our Nation's progress is reflected in the history of our great river systems. The water that courses through our rivers and streams holds the key to full national development. Uncontrolled, it wipes out homes, lives and dreams, bringing disaster in the form of floods; controlled, it is an effective artery of transportation, a boon to industrial development, a source of beauty and recreation, and the means of turning arid areas into rich and versatile cropland. In no resource field are conservation principles more applicable. By 1980, it is estimated, our national water needs will nearly double—by the end of the century they will triple. But the quantity of water which nature supplies will remain almost constant.

*The Department and the State of California are jointly constructing the $51 million San Luis unit of the Central Valley project, northwest of Fresno, Cali Under the agreement, California will meet 55 percent of the construction cos of the joint facilities, shown here.*

> "Our goal, therefore, is to have sufficient water sufficientl clean in the right place at the right time to serve the range o human and industrial needs . . .
>
> "This Administration adheres to the policy enunciated in m natural resources message of last year that our available wate supply will be used to provide maximum benefits for all purposes—hydroelectric power, irrigation and reclamation, navigation, recreation and wildlife, and municipal and industrial wate supply. These diverse uses and our future needs require thoughtful preservation and full development of our national wate resources."

## *Water Development Programs Reach New Peak*

The response to this admonition—and to the President's simultaneous reminder that the lead time is long in the development of water resources—became clearly apparent when:

1. The second session of the 87th Congress authorized the $171 million Fryingpan-Arkansas project in Colorado and the $220 million

San Juan-Chama and Navajo Indian irrigation projects in Colorado and New Mexico—the first time in the 60-year history of the Department's Bureau of Reclamation that Congress has approved two water resource projects of this magnitude in a single year.

2. The Reclamation program reached its highest level in history with total expenditures of $347 million for all activities in fiscal year 1962.

3. Congressional approval was given to Federal participation in the Delaware River Basin development program on a partnership basis with the States of Delaware, New Jersey, New York, and Pennsylvania.

4. Congress approved legislation establishing a Federal-State-local water pollution attack capability that comes closer to meeting our national needs than any we have had before, and,

5. Congressional authorization of a $75 million expenditure through fiscal years 1962–1967 made possible a considerably accelerated research and development program by the Department's Office of Saline Water.

These actions represent only the major developments in two years of rapid progress in water resource conservation.

"We cannot delude ourselves," President Kennedy told the Congress in 1961. "We must understand our resources problems and face up to them."

It required little time to indicate that we, as a people, were prepared to follow this advice.

## *Fryingpan-Arkansas Project*

One of the clearest evidences of the new progressive viewpoint came with approval of Fryingpan-Arkansas, a Reclamation project which, prior to 1962, had been advocated by conservationists for more than 30 years. Designed to divert surplus water from the western slope of the Rocky Mountains to the water-deficient eastern slope, the project, through use of a transmountain tunnel, will help irrigate the Arkansas River Basin and give drinking water and electricity to an area covering more than half the State of Colorado.

More specifically, it contemplates construction of storage and water carriage works to provide supplemental irrigation water for 280,000 acres of presently irrigated land in the Arkansas River Valley in Colorado; it will supply water to meet expanding needs for municipal, domestic, and industrial water on both sides of the Continental Divide, reduce flood damage along the Arkansas River east of Pueblo, generate annually about 500 million kilowatt-hours of hydroelectric power, and make significant contributions to recreation and to the conservation and development of fish and wildlife. Of the $171 million cost of the

*President Kennedy receives applause during his address at Pueblo, Colo., in August 1962 at ceremonies commemorating the authorization of the $17 million Fryingpan-Arkansas reclamation project in Colorado.*

project, a total of $151 million will be repaid by users, most of it with interest.

"This is an investment in the future of this country," President Kennedy said, "an investment that will repay large dividends. Its water impounded at over 9,000 feet will drop through an unprecedented seven powerplants to produce electricity for homes and factories and farms, and there will be new water for new people and new industries. Fryingpan-Arkansas is an excellent example of full development of our water resources to provide maximum benefits for all of our people."

## *San Juan-Chama and Navajo Indian Irrigation Projects*

Of similar significance was legislation authorizing the initial stage of the San Juan-Chama project and the Navajo Indian irrigation project as participating units of the Colorado River storage project.

The initial stage of the San Juan-Chama project in Colorado and New Mexico will provide urgently needed additional water for lands in areas tributary to the Rio Grande that have been centers of economic distress. It will supplement the water supply of the highly important Middle Rio Grande project, and it will provide additional water for the rapidly growing requirements of the city of Albuquerque and defense establishments of the Rio Grande Basin in New Mexico.

The Navajo Indian irrigation project provides for construction of istribution facilities to deliver water from the Navajo Reservoir, resently under construction by the Bureau of Reclamation on the an Juan River, some 150 miles across reservation lands in northestern New Mexico to irrigate more than 110,000 acres of land.

This important project will provide economic assistance to the hardressed Navajo Indians and will enable New Mexico to put to use a ajor portion of the water of the Upper Colorado River system to hich it is entitled under two interstate compacts.

## *an Luis Unit of Central Valley Project*

Another high point in Reclamation action came late in 1961 when e Department approved an agreement with the State of California r Federal construction of the $515 million Federal-State San Luis nit of the Central Valley project, northwest of Fresno, Calif. Under e agreement, California will meet 55 percent of the construction st of the joint facilities, representing a vital link in the State's ng-range program to speed economic development through the diveron of surplus water from the north to arid southern California. A easure of the scope of the project is shown in the fact that the Federal overnment will serve some 500,000 acres of farmland in the San aquin Valley with irrigation water from its portion of the unit. he Federal contribution to cost of the project will be $277 million—of hich 99.9 percent will be repaid by water users.

## *rinity Dam Completed*

In January 1962 the world's highest earthfill dam—Trinity—was mpleted 2 months ahead of schedule. Symbolizing the giant strides long-term Reclamation progress, the 537-foot-high dam is a major ature of the $251 million Trinity River division of the Central Valley roject which also includes two major tunnels that will carry water rough the mountains from Trinity River to the Sacramento River asin; Whiskeytown Dam; and three major powerplants. The ivision is scheduled to be completed by mid-1964.

Trinity Reservoir, which began filling in 1961, will store 2½ million cre-feet of water, exceeded in California only by Shasta Lake above hasta Dam on the Sacramento River. The Trinity River division ill increase by nearly 1½ million acre-feet the irrigation water available to the Central Valley project on which some half-million acres re now receiving water from Reclamation-constructed works.

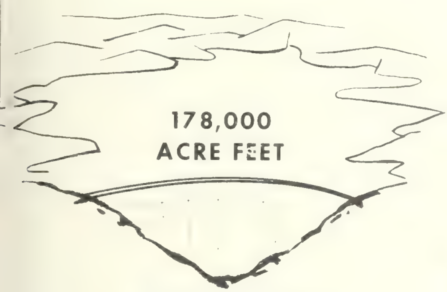
The division's three major powerplants at Trinity Dam, Clear reek, and Spring Creek are scheduled to go into operation in 1963, roducing some 1¼ billion kilowatt-hours of energy annually.

*Trinity—world's highest earthfill dam—symbolizes the giant strides in long term Reclamation progress. A major feature of the $251 million Trini River division of California's Central Valley project, dam was completed i January 1962, 2 months ahead of schedule.*

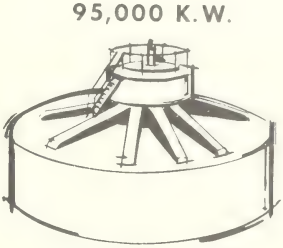
Trinity Dam's reservoir—covering 16,400 acres with a scenic 14 mile shoreline in heavily timbered mountains—provides Californi with an important recreation area. At the same time, the Trinit River works, including a fish hatchery below Lewiston Dam, will hel maintain river sports fishing as well as benefit Pacific coast commerci salmon fishing.

# CONSTRUCTION COMPLETED

## FISCAL YEAR 1962



RESERVOIRS



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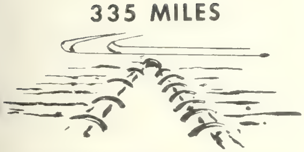
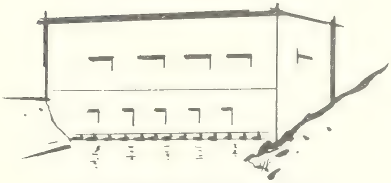
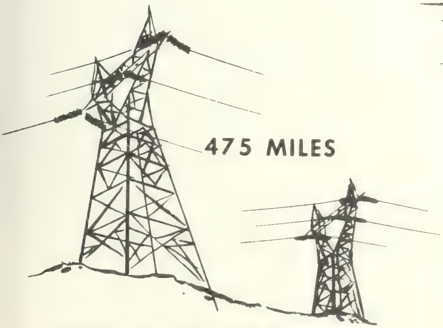
GENERATING CAPACITY



PIPELINES, CANALS
LATERALS, DRAINS



15 PUMPING PLANTS



TRANSMISSION LINES

### *300 Million in Reclamation Contracts*

In total, during the 18 months beginning in January 1961, the reau of Reclamation advanced its water resource development ograms in the 17 Western States by awarding more than 2,000 ntracts at a cost of over $300 million. Included were contracts r 13 storage dams in 10 States which when completed will provide total reservoir capacity of 5 million acre-feet of water for irrigation, hydroelectric power, municipal and industrial water supplies, recreation, fish and wildlife, and other beneficial purposes.

While this great program is being carried on in the West, its impac on the total national economy is by no means confined to that are The availability of irrigation water converts the risks of drylan farming to a consistently less hazardous and more profitable far operation. The provision of vast new sources of hydroelectric powe stimulates industrial development, modernization of rural life, an urban development. The wealth thus produced devotes itself to th national interest through increased buying power and an expande tax base.

In the words of President Kennedy, "Nothing could be mor disastrous for this country than for people from the East to say 'There is no benefit to us in spending our money to make this valle green.' That is the way to stand still. As one State does well, s do the others and if one State stands still, so do all the rest."

At the same time, there is no basis for apprehension that continuin irrigation development brings more lands into agricultural productio and hence intensifies the agricultural crop surplus problem. A dominant feature of irrigation farming is diversification. The chie

*Developing the water resources of the West, the Department of the Interio adds to the nutritious diet of the Nation without increasing production o surplus feeds and grains. The bulk of the Nation's fresh vegetables and fruit are provided through irrigation.*

roducts of irrigation are nutritious fruits and vegetables and meats hich are not in surplus and which help sustain the health and conomy of the Nation. The scope of Reclamation's contribution in is regard may be seen in the latest annual crop reports which show at the 1961 harvest on farms irrigated by Reclamation projects xceeded the billion-dollar mark for the third successive year.

While pressing ahead with visible progress in steel and concrete, e Bureau of Reclamation since January 1961 has considerably ccelerated programs of equal long-range significance in research esigned to conserve existing water supplies and to develop new ways f meeting our future water needs.

## *Veather Modification Research*

An example is a program of weather-modification research which e Bureau has undertaken in cooperation with the National Science oundation and the U.S. Weather Bureau. Contracts have been warded to three universities for research in support of the program, e long-range objective of which is to increase water supply in eclamation projects through artificially induced precipitation.

Meanwhile, stepped-up field tests have resulted in encouraging dvances in programs to develop practical techniques to reduce the urrent annual loss through evaporation of millions of acre-feet of ater from storage reservoirs, and to develop effective low-cost nings to cut similar costly losses through seepage from irrigation anals.

## *iver Basin Development*

The urgent need for action to solve our growing national water source problems has perhaps never been more clearly pointed up an in the findings of an intensive 2-year study by the Senate elect Committee on National Water Resources completed at about e time President Kennedy began his term of office.

The committee's supply-demand investigation—in which the epartment of the Interior and other agencies participated—showed:

1. That full development of all available resources in five regions of the West will be required by 1980 or earlier if the needs of that area's growing population are to be met and the projected expansion of economic activity achieved; and,
2. That by the year 2000, three other regions—including one east of the Mississippi—will be added to the list if water supplies are to meet demands.

In response to this and other danger signals, the President for- arded to the Congress a blueprint for the comprehensive, progressive machinery so long needed if we are to be serious in our efforts assure adequate water for present and future needs. His propos Water Resources Planning Act would:

— Establish a Cabinet-level Water Resources Council to the keystone in a comprehensive structure for water resour planning within river basins and would provide overall guidan and standards for planning, consistent with existing law;

— Authorize the President to create—at the request of t Governor of one or more affected States, or of the Council— river basin water resources commission for any region, maj river basin, or group of related river basins in the United State These commissions, composed of representatives of the Stat and Federal agencies concerned, would be charged with preparir and keeping up to date integrated plans for Federal, State, ar local development of water and related land resources, and,

— Provide encouragement to the States to participate full and effectively in water and related land resource plannir through a system of Federal financial assistance.

The act would require that any river basin plan take into accou domestic, agricultural, energy, industrial, recreational, fish an wildlife, and other major resource conservation and developmen It would enable the Congress—within the Federal sphere of respons bility—to decide upon the many individual project developments o the basis of full information as to the overall needs and timing fo basin development. At the same time, States and local interests— within their respective spheres of responsibility—would be enable to do likewise.

## *Delaware River Basin Project*

With action on this far-reaching measure pending in the Congress the Federal Government moved on another front to save valuabl time in the race against the day when water of acceptable qualit will not meet the needs of a large part of the United States.

With congressional approval, agreement was reached for Federa participation in the unique organizational experiment in multiple purpose water resource management currently underway in th Delaware River basin.

The instrument for this management and development is the Delaware River Basin Commission, representing the first effort to creat a form of Federal-Interstate Compact organization empowered to represent both the Federal Government and the States of Delaware New Jersey, New York, and Pennsylvania in planning, programing scheduling, financing, and executing a water resource program o

ital economic importance to 21 million people in this major eastern
atershed.

Today, rapid and encouraging progress is being made toward
unching of a development program involving a potential billion-
ollar investment in flood control, outdoor recreation facilities, soil
onservation projects, water pollution control works, fish and wild-
fe management facilities, pumped storage power facilities, municipal
ater supply works, river regulation, and diversions of navigation
cilities.

## aline Water Consersion

In his special conservation message to the Congress in February
961, President Kennedy declared: "No water resources program is of
eater long-range importance—for relief not only of our shortages,
ut for arid nations the world over—than our efforts to find aneffec-
ve and economical way to convert water from the world's greatest,
heapest natural resources—our oceans—into water fit for consump-
on in the home and by industry . . . This Administration is cur-
ntly engaged in redoubled efforts to select the most promising
pproaches to economic desalinization of ocean and brackish waters,
nd then focus our energies more intensively on those approaches . . .
urge the Congress to extend the current saline water conversion
search program, and to increase the funds for its continuation."

Congressional response to this appeal was prompt. Today, with a
75 million program authorized through fiscal year 1967, saline water
search and development activities are moving forward at a nota-
y quickened pace. The past 2 years have seen these highlights of
ogress:

— Demonstration plants are in operation at Freeport, Tex., Webster, S. Dak., and San Diego, Calif.—with millions of gallons of converted fresh water flowing daily to consumers.

— A million-gallon-a-day demonstration plant is under construction at Roswell, N. Mex., and is scheduled to go into operation in 1963.

— Negotiations are underway for construction of a large freezing process pilot plant at Wrightsville Beach, N.C., to fully exploit, as rapidly as possible, this promising desalination method.

— Research and development contract awards by the Department's Office of Saline Water increased from $1.2 million for the first half of fiscal 1962 to $5.6 million in the second half.

— In March 1962, the Office of Saline Water transferred $365,000 to the Atomic Energy Commission for participation by the Commission's Oak Ridge National Laboratory in basic research phases of the saline water conversion program. Thus,

*New Point Loma sea-water desalting plant near San Diego, Calif., points ou multiple piping systems through which the flash evaporator process function*

for the first time, the skills and capabilities of the personnel a the Oak Ridge laboratories were brought to bear on problem other than those of an atomic nature. The agreement with AE marked the largest single expenditure for basic research by th Office of Saline Water in its 10-year history which has seen th cost of conversion reduced from about $5 per thousand gallon to a minimum of about $1.

During the year, the benefits of saline water conversion were dra- atically demonstrated in the Virgin Islands, one of the territories lministered by the Department. A saline water plant operated by le Virgin Islands Corporation was successful beyond expectations. rinking water formerly had to be brought into the territory by barge, a cost of more than $3 per thousand gallons. The saline water plant as expected to produce about 250,000 gallons daily for approximately .75 per thousand. But since February of this year it has been pro- ucing about 300,000 gallons daily for $1.63 per thousand.

President Kennedy's continuing deep personal interest in the ulti- ate success of our saline water efforts perhaps was most clearly dicated in his address to the White House Conference on Conserva- on in May 1962. In his remarks, the President said, "Our great ntribution in the 1950's and 1960's, it seems to me, is applying the eat discoveries of science to this question of conservation, how to get esh water from salt water at competitive terms, a matter which can ean such an extraordinary amount to people of the West, the South- est, and really in a sense to people all around the globe. I have felt at whatever country can do this in a competitive way will get a od deal more lasting benefit than those countries that may be even st in space."

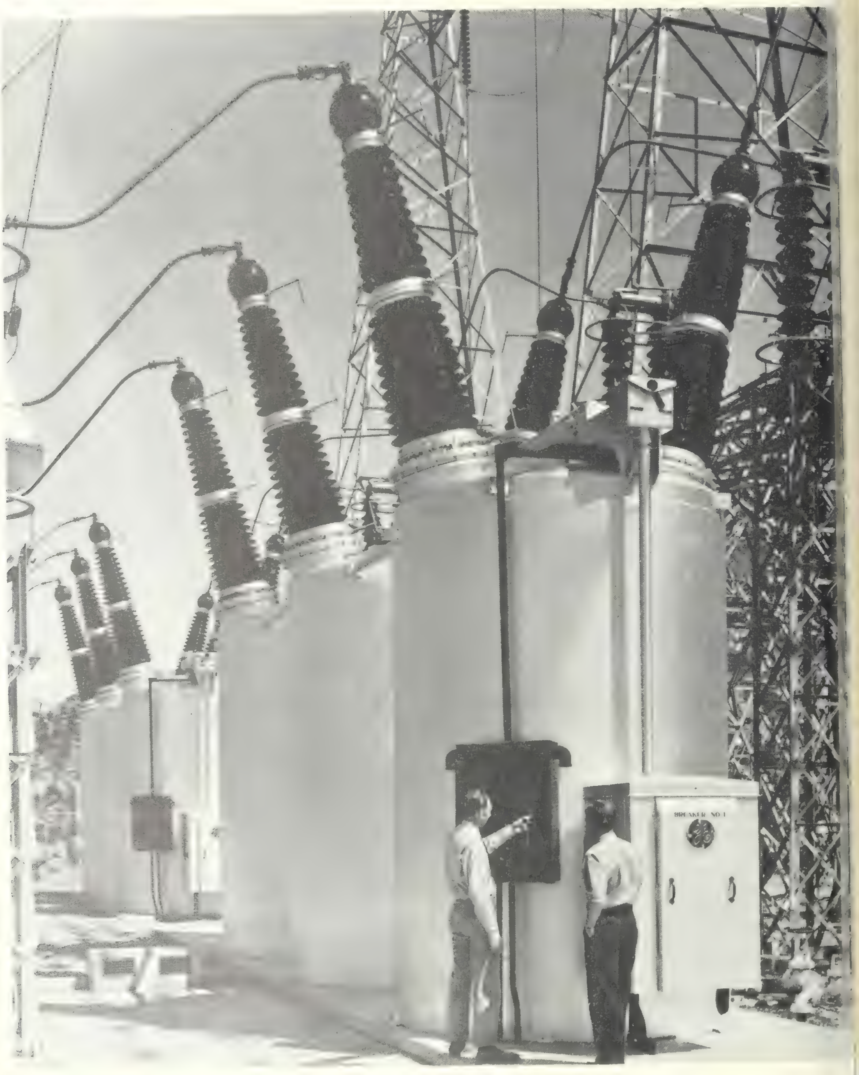
### *ew Water Resource Evaluation Standards*

In another significant water conservation action, the Secretaries Health, Education, and Welfare, Agriculture, Interior, and of the my, acting as a Water Resources Council, developed an up-to-date t of uniform standards to facilitate national progress in the formula- on and evaluation of water resources projects. In May 1962, the esident approved these new policies, standards, and procedures for plication by the four departments and the Bureau of the Budget. plementation of these standards means that for the first time full mprehensive treatment of all water and related land uses, including ternative uses, are to be given consideration in the planning and aluation of water projects.

## *Electric Power*

One of the major challenges in resource conservation lies in the derly development and efficient utilization of energy resources to eet the Nation's electric power needs—needs which double every cade.

To meet the challenge, this Administration has moved forward ore rapidly in electric power development—including significant



*Modern equipment such as this helps to provide the needs of our Wester States for electric power. This is one of the many functions of Reclamatio programs.*

innovations until recently considered impractical or impossible—tha any other in many years.

"Our goal," President Kennedy has said, "is to ensure an abundanc of low-cost power for all consumers—urban and rural, industrial an domestic. To achieve this, we must use more effectively all sourc of fuel, find cheaper ways to harness nuclear energy, develop o hydroelectric potential, utilize presently unused heat produced b ature or as a byproduct of industrial processes, and even capture the nergy of the tides where feasible."

## ooperative Power Pooling

As a first step in this approach, the President directed the Depart- ent to develop plans for the early interconnection of areas served by s hydroelectric power marketing agencies with adequate common arrier transmission lines; to plan for further national cooperative ooling of electric power, both public and private; and to enlarge ich pooling as was then in existence.

The first result came soon afterward when the Department's onneville Power Administration, the U.S. Army Corps of Engineers, id nine private and public owners of hydroelectric generating cilities signed a coordination agreement designed to produce maxi- um power at powerplants on Pacific Northwest rivers.

The agreement provided that storage and generating facilities ould be operated in much the same manner as if all were under one wnership; it also provided for interchanges of energy and power nong the signers in order to conserve water in reservoirs, and for ordination of the transmission facilities of the parties to the agree- ent.

This pioneering agreement, involving 65 hydroelectric plants and steam plants with total installed capacity of 11.8 million kilowatts, oduces an extra million or more kilowatts of firm power that would wasted if each utility operated its hydroplants independently.

A major breakthrough toward achieving the Administration's goal more plentiful low-cost power through the pooling of public and ivate facilities came after Congress, in 1961, approved construction an all-Federal basis of the backbone transmission lines required to arket the power generated by the giant five-State Colorado River orage project.

## Competitive Cooperation" Launched

Early in 1962, the Department announced the far-reaching decision at some of the transmission lines for the Colorado River project ould be built by private utilities—and thus a new era of "competitive operation" between public and private utilities was brought into ing.

Among other significant benefits, the Colorado River decision will duce the investment in Federal facilities by $27 million; make for ore reliable delivery of Federal hydropower to preference customers lower costs and, in turn, make the private company systems more liable. Additionally, it will add $77 million to the project's basin nd by the year 2042, when the 87-year payout period is completed.

Contracts have been signed between the Department and priva utilities serving Utah, New Mexico, Colorado, and Wyoming for tran mission of CRSP power over an interconnecting system of Fede and private power lines. A total of about 1.2 million kilowatts w be generated at the authorized hydroelectric plants of the stora project.

## *Other Pooling Agreements*

With public-private pooling arrangements spreading rapidly to oth areas, these have been among developments of 1962:

— Contracts have been signed between the Government a Missouri cooperatives which will assure a steady flow of elect power to more than one million customers in that State throu the pooling of generating and transmission facilities of the Fe eral Government, rural electric cooperatives, and private utiliti

— The Department has accepted a proposal by the Basin Ele tric Power Cooperative Association of North Dakota to ent contract pooling arrangements with the Bureau of Reclamatio thereby making possible the establishment of a large generati plant in the lignite coalfields of North Dakota. This acti should assure the development of North Dakota's vast ligni resources and could provide the low-cost power needed for t economic development of the entire upper Missouri River Bas region. Similar action in Colorado will provide economic stim lus to that State's coal industry.

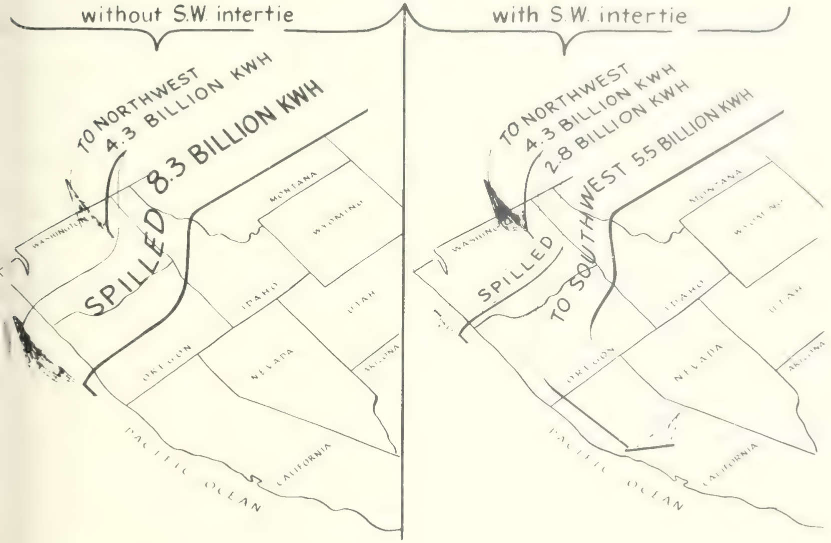
## *Extra-High-Voltage Direct-Current Transmission*

Today in the United States, and throughout the world, we are at "new frontier" in electricity. Giant new generators are being bui with a capacity of a million or more kilowatts, one of which alone ca produce enough power to supply a city the size of Washington, D.

In a relatively short period of time this means the possibility transmitting: Yukon River power to Seattle and, by displacement, Los Angeles; mine-mouth power from West Virginia coalfields to Ne York and Boston, and from Dakota lignite beds to Chicago and D troit; power flowing east and west to take advantage of time diversit power flowing north and south for seasonal diversity; the integratio of hydro and steam systems; and, most important, cheaper electrici for all consumers.

Early this year a departmental task force appointed in 1961 study an extra-high-voltage common carrier interconnection betwe the Pacific Northwest and Pacific Southwest completed its investig tions. In a report widely recognized as a technological landmark, th

DISPOSITION OF SECONDARY ENERGY
1966-67



ectric power experts composing the task force found extra-high-ltage direct current transmission not only feasible but, from the gineering standpoint, immediately practicable for these—and her—regions, with the promise of highly important economic nefits.

As a result of this investigation, studies of four high-voltage inter-es between the Pacific Northwest and other regions are presently in rious stages of development. The first of these, the Pacific North-est-Pacific Southwest extra-high-voltage intertie to provide for an terchange of electric power between the predominantly fuel-fired ectric generating plants in the Pacific Southwest and the predomi-ntly hydroelectric generating plants of the Pacific Northwest, is aiting passage of preference legislation guaranteeing reciprocal re-onal preference to electric energy generated at Federal plants to nsumers in both the Pacific Northwest and regions interconnected th the Pacific Northwest. This intertie would reduce the amount peaking capacity needed in the Pacific Northwest and Pacific uthwest as well as conserve the energy obtainable from water that ould otherwise be spilled by Pacific Northwest hydroelectric plants ring the summer months when Pacific Southwest loads hit their ak. In addition, the use of Pacific Northwest hydroelectric power nserves supplies of coal, oil, and gas in the Pacific Southwest.

The second intertie is to provide a connection between the We Kootenay Power & Light Co. in British Columbia and the Bonnevil grid at the Canadian border. This regional intertie line is schedule to be energized in July of 1964, with construction beginning this yea By use of this intertie, the West Kootenay Light & Power Co. ca store water in their Kootenay Lake reservoir during August and th first part of September by supplying part of its system loads wit energy from Bonneville Power Administration. A like amount energy will be returned starting at about the middle of Septembe Benefit to the Federal power system from these operations is estimate at some 53,000 kilowatts of firm power.

Meanwhile, studies of a third and fourth high-voltage intertie— between the Missouri Basin and southern Idaho and the Bonnevill Power Administration system—are nearing completion.

## *High Voltage Tests Accelerated*

Work is being accelerated by the Bonneville Power Administratio on tests relating to high-voltage direct current transmission. Sig nificantly different from any tests previously undertaken in the Unite States, they will, in fact, provide data not yet available either here o in Europe. While direct current transmission is used in Europe notably in Sweden, most of it is under ground or under water. Th Bonneville tests will be performed on insulators and conductors strun on towers in a manner similar to alternating current transmissio lines. Marking the start of intensive research in this new technique the Allis Chalmers Manufacturing Co. of Milwaukee has been awarde a $689,000 contract to build components necessary to convert regula alternating current from the Dalles Dam, on the Columbia Rive between Oregon and Washington, into direct current and at voltag to extremes not yet approached in this country.

## *Atomic Power*

Approval was given at the close of the 2nd session of the 87th Con gress to construction of the world's largest atomic powerplant a Hanford, Wash., to utilize steam from the Atomic Energy Commis sion's new production reactor.

As a result of the action—representing a significant example of th use of an important resource which would otherwise be wasted—th Washington State public power supply system will build and operat 800,000-kilowatt generating facilities at Hanford and deliver th output to local publicly and privately owned utilities which, in turn will exchange it with the Bonneville Power Administration for a bloc of firm power on a nonprofit basis.

The Hanford Act assures Pacific Northwest industries, farmers, d other consumers of a new firm power supply equal to that produced a major dam and considerably reduces the threat of a previously ticipated regional power shortage within the next few years.

Until passage of the act, Bonneville since 1960 had been unable to fer substantial amounts of firm power to prospective industries. timate employment of up to 50,000 workers now is possible in new dustries expected to be attracted by the additional source of in- pensive energy.

### *umped-Back Storage*

Congressional authorization of a $150,000 appropriation has enabled e Department to make significant progress in its studies of the poten- ls of pumped-back storage projects at Federal reservoirs.

Representing another "new frontier" in the field of power produc- n and marketing, the plan uses cheap off-peak energy to pump ter to high elevations for later release to generate hydroelectricity hours of peak consumption, thus permitting important savings in ant investment for generating capacity.

## *Parks and Recreation*

The far-reaching report of the Outdoor Recreation Resources view Commission, following two years of intensive study of nerica's outdoor needs, contained these significant paragraphs:

> "Through their prodigious purchases of sporting equipment, hunting and fishing licenses, and other recreational goods the American people have demonstrated an intense (and verifiable) desire to participate in outdoor recreation. Through their expressions of preferences at the ballot box, through repeated and increasing appropriations for recreational development of Federal resources, and through many, and rapidly growing, recreational visits to federally managed resources, the American people have expressed an intense (and verifiable) desire to use such resources for outdoor recreation.
>
> "Outdoor recreation also has cultural values that are essential to the health of the Nation. It is a part of the educational process that strengthens men's minds as well as their bodies; that broadens their understanding of the laws of nature; that sharpens their appreciation of its manifold beauties; and that fortifies man's most precious possession—the spirit which gives life its meaning. These are the qualities which in the long run make a nation and its people truly great and which find strong nourishment in outdoor recreation."

In an atmosphere of growing awareness of these basic facts, substantial progress has been made since January 1961 in providing fo America's present and future outdoor recreation needs.

President Kennedy told the 1962 White House Conference on Conservation: "I can think of no more suitable effort for an administration which is concerned with progress than to be identified wit efforts to preserve this land and maintain its beauty."

## *Highlights of Progress*

The President's consistent support of programs to provide adequat recreational facilities to meet our growing needs has been a majo factor in an outstanding 2-year record of accomplishments of whic the following are highlights:

— Cape Cod in Massachusetts, Point Reyes in California, an Padre Island in Texas have been authorized as new Nationa Seashore Areas as part of a comprehensive program to provid outdoor recreation areas adjacent to metropolitan centers.

— The National Park System was further improved wit establishment of Haleakala National Park in Hawaii; City o Refuge National Historic Site, also in Hawaii; Buck Island Ree National Memorial near St. Croix, V.I.; Arkansas Post Nationa

*Another addition to the outdoor areas reserved for public use in the past year is this new national seashore at Point Reyes, just 30 miles from San Francisco.*

*his is Padre Island, Tex., an unspoiled shoreline area added to the National*
*ırk System in a comprehensive program to provide outdoor recreation facili-*
*s near crowded metropolitan centers.*

Memorial in Arkansas; Russell Cave National Monument in Alabama; St. Thomas National Historic Site in the Virgin Islands; and Theodore Roosevelt Birthplace and Sagamore Hill National Historic Sites in New York.

— Enactment of the Housing Act of 1961, a landmark in conservation effort, now enables urban areas to guide their growth and development through the acquisition of public lands in tracts up to 5,000 acres for recreation and other purposes.

— To provide additional recreational resources, the Department has inaugurated an intensive program for expanded recreational use of public lands. A major feature of the program is the sale to State and local governments of public lands expressly for outdoor recreation at the nominal fee of $2.50 per acre.

— Under revised regulations affecting the construction of federally financed reservoirs, sufficient land can now be acquired to preserve the recreational potential of large water impoundments.

## *New Federal Recreation Agency*

— A Bureau of Outdoor Recreation has been established in th Department to coordinate Federal recreation programs; stimulate and provide assistance to the States in the development o recreation programs; sponsor and conduct research; encourag interstate and regional cooperative recreation projects; conduc recreation resource surveys; and formulate a national recreatio plan on the basis of State, regional, and Federal plans.

— The President, by Executive order, established a Cabinet-leve Recreation Advisory Council—consisting of the Secretaries of th Interior, Agriculture, Defense, Health, Education, and Welfare and the Administrator of the Housing and Home Financ Agency—to facilitate coordinated efforts among the variou Federal agencies concerned with outdoor recreation.

— Preliminary hearings have paved the way for congressiona action on the President's request for establishment of a "pay-as-you-go" land conservation fund to finance acquisition of land for conservation and recreation purposes. The fund would b

*Elk hunting is tops on the Fort Apache Indian Reservation. Development o recreational resources on Indian reservations is being pressed vigorously b many tribal groups.*

supported by recreation taxes and user charges to apply originally against an advance appropriation of $500 million.

— Congress authorized use for recreation of facilities at wildlife refuges and fish hatcheries provided it does not interfere with primary conservation objectives. Under this legislation, the Department of the Interior will install recreational facilities, including picnic areas, swimming beaches, and boat docks, at some 200 federally operated hatcheries and refuges.

— A special recreation inventory, scheduled for completion early in 1963, is being conducted by the Department's Bureau of Land Management to identify areas of the national land reserve suitable for public recreation.

— During fiscal year 1962, a total of 19 research contracts, involving a commitment of $720,000, were let under the Area Redevelopment Act to accelerate the development of recreational attractions on Indian reservations. New recreation facilities are being planned in Indian areas of Nevada, Oregon, South Dakota, Wyoming, Wisconsin, Colorado, and Alaska, and the tribal-owned Fort Apache Reservation's White Mountain enterprise in Arizona is expanding recreational development from seasonal to year-round use.

## *ther Highlights*

— The Senate approved and the House gave preliminary consideration to legislation authorizing a study of the Nation's ocean, lake, and river shorelines to develop a Federal-State shoreline preservation program.

— Important new legislation will permit the orderly movement of millions of acres of agricultural land not needed to produce food and fibers to recreational and other uses.

— A Presidential recommendation that the Federal Surplus Property Disposal Act be amended to permit States and local governments to acquire surplus Federal lands for park and recreation uses on more liberal terms is awaiting congressional action.

— Recognition of the interrelationship of the nations of the world in developing plans to meet recreation needs was given with convening in June 1962 of the First World Conference on National Parks in Seattle, Wash., attended by delegates from 63 nations.

## *he Need for Open Space*

"It is our task in our time and in our generation," President Kennedy has said, "to hand down undiminished to those who come after us, what was handed down to us by those who went

> before, the natural wealth and beauty which is ours . . . a America of open spaces, of fresh water, of green country; a plac where wildlife and natural beauty cannot be despoiled, wher increasing urbanized population can still find the spiritu strength upon which our greatness as a country depends."

That we as a nation have neglected this task in recent decades seen in the fact that from 1900 through 1920 we added 8½ millio acres to the Federal system of parks and monuments administered b the Department's National Park Service; in the next 20 years th figure rose to well over 10 million; but from 1941 to January 1961 th total additional space set aside for the use and enjoyment of all th people amounted to just over 92,000 acres.

The unimpressive record of the past 20 years has corresponde with a period of unparalleled population growth—and with a rediscovery by millions of Americans of the value of the out-of-door It is an almost incredible fact that 90 percent of our people now tak part in some form of outdoor recreation. This translates int 4½ billion individual recreation activities a year. By far the greates single recreational attraction is water, and last year well over 10 million citizens were estimated to have participated in some form water recreation. In 1961, some 16½ million Americans crowde our campgrounds—a gain of about 2 million in a single year. Man

*Open space is being given more emphasis today than in many years. A example of the peace to be found in the out-of-doors is seen in this view a the Grand Canyon of the Yellowstone.*

lditional millions hunted, fished, skied, or took part in some other rm of outdoor recreation.

In his 1962 message to the Congress on conservation, the President binted out that we may look forward to still heavier demands for creation facilities in the years ahead.

In response to his 1961 natural resource message, the 1st session the 87th Congress had authorized establishment of the great outer ach of Cape Cod as a National Seashore Area, the first major ldition to the National Park System in 14 years.

In 1962, the Congress moved even more rapidly to meet recreational eds with approval of an 80½-mile-long national seashore park pre-rving the unspoiled natural beauty of Padre Island off the coast of xas, and authorization of the establishment of a third new National ashore Area at Point Reyes, an undeveloped area of great beauty st 30 miles from San Francisco.

These three actions alone added considerably more acreage to the ational Park System than the total additions of the previous 20 ars. Prior to 1961, only 336 miles of the Atlantic coast and 296 les of the Pacific shorelines were available as public lands. The ee new seashore areas provide the American people with nearly lf again that total—some 285 miles of unspoiled seacoast for blic use.

## *ther Additions*

Visitors to our network of national parks and monuments now total re than 85 million annually. Since January 1961 the process of iching and rounding out this great network also has included this ogress through both Congressional and executive action:

— The world-famous 10,023-foot Haleakala Volcano in Hawaii became the center of a new National Park—the 30th in the Federal system and the first to be established since 1956.

— Hawaii's new City of Refuge National Historic Site preserves the "sacred" ground where vanquished Hawaiian warriors of old could find a guarantee of sanctuary.

— In the Virgin Islands, the new Buck Island Reef National Memorial protects one of the finest marine gardens in the Caribbean Sea.

— The first pioneer settlement of the lower Mississippi Valley is commemorated by the new Arkansas Post National Memorial.

— An archeological record of human habitation from 6000 B.C. to about A.D. 1650 is contained in Alabama's new Russell Cave National Monument.

—The new St. Thomas National Historic Site contains Fo Christian, completed in 1680—the oldest existing structure in th Virgin Islands.

—New York City's new Theodore Roosevelt Birthplac National Historic Site preserves the home where Roosevelt spen part of his childhood, and Sagamore Hill National Historic Sit protects the Long Island mansion which was the 26th President home from 1887 until his death in 1919. Both were gifts thi year to the Government and the people from private philanthropi individuals and organizations.

At the same time, the groundwork was laid for Congressional actio on the establishment of additional park areas recommended b President Kennedy in his 1962 conservation message.

## *Reclamation's Contribution*

While Reclamation projects are constructed to provide such primar benefits as irrigation, hydroelectric power, municipal and industri water, and stream control, they also provide recreational benefit which are becoming increasingly important with the rapid increase i population.

*Federal reservoirs provide recreation at an ever-expanding inland shorelin for a growing number of Americans. This is a scene at the Colorado-Bi Thompson project at Grand Lake, Colo.*

For example, a significant portion of the growing demand for outdoor recreational opportunities in the Pacific Northwest is being met by facilities of Bureau of Reclamation projects. Almost 4 million visitor days were recorded at some 65 different recreational areas during 1961—a 30-percent increase over 1958. During the first half of 1962, 91,700 visitors took advantage of the self-guided tour at Grand Coulee Dam. The comparable figure for 1961 was 40,000.

Another major attraction for tourists has been the construction of Glen Canyon Dam on the Colorado River in Arizona. A temporary ourist center was completed in June 1961. Farther down the river, in June 1962, nearly 70,000 visitors toured Hoover Dam.

In total, visitors to the some 190 manmade reservoir lakes of the Bureau of Reclamation in all areas of the West now approximate 26 million annually—indicating America's appreciation of this major new recreational resource. This represents an increase of one-third over 1958, and a quadrupling of use since 1950.

### *Joint Effort Required*

Referring to the immensity of the effort which will be necessary to provide adequately for the Nation's foreseeable requirements for recreational space and facilities, President Kennedy, in his 1961 special message to the Congress on natural resources, said: "It is not a task which should or can be done by the Federal Government alone. Only through the fullest participation and cooperation of State and local governments and private industry can it be done wisely and effectively."

Working in close coordination with the President's new Recreation Advisory Council, the Department's Bureau of Outdoor Recreation has made significant progress toward achievement of this aim. In the months or so since its establishment, the Bureau has held exploratory meetings with many State officials looking toward establishment of Federal grants-in-aid and technical service assistance programs.

## *Sport Fisheries and Wildlife*

In the past decade, while the U.S. population increased by almost 20 percent, total hunting and fishing licenses sold almost doubled the rate of population increase.

At the same time, rapid advances in engineering techniques have made possible a vastly accelerated exploitation of natural resources—with corresponding reductions in favorable wildlife environment.

Wildlife, therefore, is caught in a squeeze from two directions: diminishing habitat and increased demand.

*How progress in urban development threatens wetlands needed for fish an wildlife protection is graphically illustrated in this Florida area.*

The growing intensity of the demand for this form of outdoo recreation may be seen in the fact that, in 1960, nearly 25.5 millio anglers spent $2.7 billion and drove 18.8 billion miles. During th same year, 14.6 million hunters spent more than $1.6 billion and drov 7.6 billion miles in pursuit of that sport. It is estimated that on man in every four goes fishing today, one in every five goes huntin and the percentage is still rising.

One problem in attempting to meet the tremendous demand fo hunting and fishing opportunities may be seen when these facts ar considered: Wetlands are, acre for acre, considered to be the mos productive wildlife habitat. The most recent wetlands inventor of the Department's Fish and Wildlife Service, published in 1961 listed 38 game and fur-bearing species—in addition to great flights o waterfowl—making use of one or more of the 20 types of wetlands i the various States. It is estimated that there were 127 million acre of these marshes and swamps when white men first appeared on thi continent. Through drainage, flood control, and other measure this area has been reduced to about 74.5 million acres, of which onl 22.5 million is considered good wildlife habitat.

*Ducks in flight over feeding station at North Dakota refuge. The 87th Congress—in one of its major conservation actions—authorized the Department to "borrow" funds against future duck stamp revenue to accelerate wetlands purchase.*

## *Action to Meet the Problem*

To meet this two-pronged problem, the Congress—in one of its major conservation actions of 1961—approved a departmental proposal that it be allowed to "borrow" funds against future duck stamp revenue to speed up wetlands purchase.

That extraordinary action was sorely needed is shown in the fact that, before 1961, land acquired for Federal wildlife refuges cost an average of $12.40 an acre; in fiscal year 1961, this average price increased to $69.39 an acre; while in the 1962 fiscal year the average price was $86.71 per acre.

With an authorized 7-year advance of $105 million to acquire land ahead of rising prices, the Department of the Interior, under the new legislation, has been enabled to move forward with a greatly accelerated program for the preservation of wildlife as a major recreational resource. The Department's 7-year program contemplates the acquisition of 2,950,000 acres of land. Of this total, about 1.2 million acres will be for new migratory waterfowl refuges or additions to existing refuges. The remaining 1,750,000 acres will be for waterfow production areas in the prairie States. In fiscal year 1962, funds wer obligated for the acquisition of 18,915 acres for refuges and 16,64 acres for wildlife production areas in 16 States. At the same time additional funds were obligated for 16,650 acres of small wetlands fo waterfowl production in North and South Dakota and Minnesota.

The especially acute problem confronting these three prairie State was pointed up in the report of the Senate Select Committee o National Water Resources. The rapid decrease in wetlands, the report said, "is particularly acute in a 56,000-square-mile area of th northern prairies in Minnesota, North Dakota, and South Dakota In that section there exists the most valuable area for waterfowl production in the coterminous United States. Since 1943, an estimate 1,027,000 acres of this area has been destroyed by the expenditur by the Federal Government of an estimated $25 million for farn drainage."

It was with particular reference to this problem that Presiden Kennedy told the Congress in his 1962 conservation message: "I an hopeful that consistent and coordinated Federal leadership can expan our fish and wildlife opportunites without the present conflicts o agencies and interests: One Department paying to have wetland drained for agricultural purposes while another is purchasing suc lands for wildlife or waterfowl refuges."

## *Progress Through Coordination*

Taking cognizance of the urgency of the problem, the 87th Congres undertook positive corrective action with passage of legislation providing that the Secretary of Agriculture may not grant technical o financial assistance for drainage projects in Minnesota or the Dakota which are found by the Secretary of the Interior to be harmful t waterfowl, if within 1 year the Fish and Wildlife Service or a Stat fish and game agency offers to lease or purchase the affected wetlands This important legislation had the endorsement of both Departments Even prior to its passage the two agencies had reached administrativ agreement on a joint drainage-project policy which has permitte substantial progress in protection of threatened waterfowl productio areas in the Prairie States as well as in other regions.

Meanwhile, through agreement reached between the Department o the Interior and the Army early this year on the protection of land around Federal reservoirs, fish and wildlife and outdoor recreatio programs have been considerably accelerated. Under the previou policy, adopted in October 1953, the Bureau of Reclamation and th Corps of Engineers obtained land title only to a relatively narrow strip around reservoirs. The new policy provides for the acquisitio

*Pothole areas of Central States, vital waterfowl breeding grounds, are now eing saved by the Department through expanded program for protection of wildlife.*

of sufficient land to meet both present and future requirements for recreation and fish and wildlife development and management.

## *Progress Through Cooperation*

In April 1961, the Department announced inauguration of a new ype of public land management program with formal designation of 92-square-mile Federal-State cooperative land and wildlife management area in south-central California.

Created by this pioneering agreement was the Caliente National Cooperative Land and Wildlife Management Area consisting of 58,868 acres of public lands to be administered by the Bureau of Land Management in cooperation with the Fish and Wildlife Service and the State of California. Through a cooperative program, the Department and the State agreed to jointly develop the wildlife, recreational, and other natural resources of the area, noted for its quail and partridge hunting.

In little more than a year, 10 additional cooperative areas had been established, assuring the development of the recreational and fish and wildlife potentials of hundreds of thousands of acres to meet the needs of California's expanding population.

*Congress has authorized the development of outdoor recreational resources f public use at wildlife refuges, so long as basic objectives of wildlife manag ment are not hindered.*

## *Contribution to Recreation*

The important contribution made by our National Wildlife Refug in providing outdoor recreation opportunities is shown by the 1 million visitors to those areas in 1961—a figure more than tripled 10 years.

A long existing difficulty in this regard has been the fact that th refuges are not equipped with either facilities or personnel to accom modate this large and rapidly increasing influx of visitors.

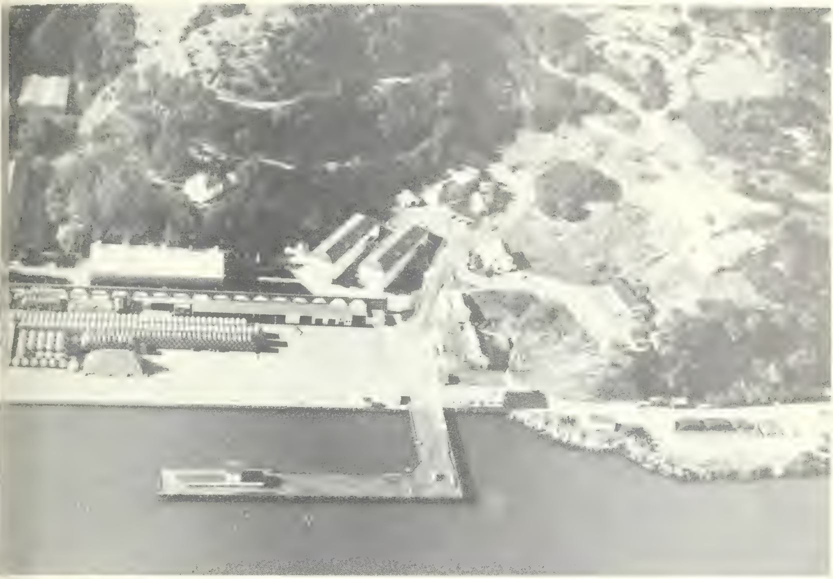
The 87th Congress took action to remedy this situation throug passage of legislation formally authorizing use for recreation of f cilities at wildlife refuges and fish hatcheries provided it does n interfere with primary conservation objectives.

With this authorization, the Department of the Interior is enable to proceed with the installation of recreational facilities, includi picnic areas, swimming beaches, and boat docks, at about 200 fe erally operated hatcheries and refuges.

## *Other Progress*

Other highlights of the significant progress in fish and wildli resource development since January 1961 include:

— Four new wildlife refuges have been established—in Ohi Michigan, Mississippi, and Georgia—and the Migratory Bir



*xpansion of the Department's fish and wildlife program is marked by tablishment of marine laboratories such as this one at Tiburon, Calif.*

Conservation Commission has approved (*a*) the creation of three additional new wildlife refuges; (*b*) enlargement of nine existing wildlife refuges; and (*c*) the acquisition of lands for five additional waterfowl refuge projects. In all, a total of well over 100,000 acres is scheduled to be added to the Nation's wildlife and waterfowl sanctuaries under these actions.

— The Department has approved an order setting aside public lands in Utah for a new national fish hatchery which promises important benefits to that State's economy and recreational fishing.

— A new marine laboratory has been established at Sandy Hook, N.J., to study management of salt-water sport fish—the basis of a growing industry.

— A national reservoir fishery research program has been launched with establishment of two new research centers in South Dakota and Arkansas.

— Preliminary hearings paved the way for Congressional action on legislation to safeguard for waterfowl use the vital Klamath-Tule Lake wildlife area near the California-Oregon line. The legislation—which would solve a problem that has been under discussion for over 20 years—is designed to permit present agricultural use while simultaneously protecting waterfowl rights in three refuges.

— Valuable new progress has been made in studies of diseas and pesticides by the new Federal Pest Control Review Boar established in 1961 because of concern over losses of fish an wildlife and possible hazards to public health because of increasing aerial spraying of poisonous pesticides.

— An advisory board composed of distinguished wildli experts and conservationists has been appointed to assist i formulating wildlife management programs and policies o lands administered by the Department of the Interior.

— Recognition of the growing need for knowledge, particularl among young students, of our fishery resources, was provide by Congress in authorizing establishment in Washington, D.C of a $10 million National Fisheries Center and Aquarium. I addition to educational benefits for many thousand of visitors t the Capital, the new center will make significant contribution to numerous scientific studies including medical and biologica research.

## *Public Land Resources*

One hundred years ago the Congress passed the Homestead Act—providing a significant stimulus to our national development.

In the century that has followed, more than 1.1 billion acres of th original public domain have been transferred to private and non Federal public ownership.

Today, the 768 million acres remaining in Federal ownershi represent one of our most important assets, with the millions of acre set aside for national parks, forests, and wildlife refuges contributin increasingly to the national welfare.

Yet, exclusive of Alaska, 180 million acres of public-domain lan awaits the realization of its full potential.

It was in cognizance of this fact that President Kennedy in hi February 1961 conservation message to the Congress describe unused public land as "a vital national reserve that should be devote to productive use now and maintained for future generations."

> "Much of the public domain," he wrote, "suffers from uncontrolled use and a lack of proper management. More than 10 million acres of our Federal Grazing Districts are producin livestock forage well below their potential. We can no longe afford to sit by while our public domain assets so deteriorate."

In response, the Department of the Interior immediately took action on a broader scale than any undertaken in many years to assur better usage of, and more adequate returns from the resources of the public land.

Within weeks, an 18-month moratorium was ordered on most ypes of nonmineral applications for land of the public domain of vhich there then existed an overwhelming backlog—representing the ccumulation of three to four years.

## *Aims of the Moratorium*

The moratorium allowed time for three critical activities by the Department:

First: Reduce the backlog of applications to manageable proportions.

Second: Move forward with a long-needed comprehensive inventory, valuation, and classification of public lands; and,

Third: Review and revise Departmental regulations and initiate egislative proposals necessary to modernize the Nation's land laws.

With termination of the moratorium in September 1962, the acklog of applications had been reduced from 40,000 to 17,000.

Only through knowledge of the characteristics and capabilities of he public lands can their best usage in the public interest be achieved. More orderly handling of land office business has permitted the Department to undertake the first fully comprehensive inventory and valuation of the national land reserve in history.

With completion of the initial phase of this large-scale project cheduled for mid-1963, the work thus far accomplished has pointed he way to important conservation gains.

An example of benefits to be realized through comprehensive and up-to-date inventories may be found in the forest resources on public ands. Under this Administration, the Department has considerably xpanded its cooperative efforts with the Department of Agriculture o improve on timber sale practices and achieve a further standardization of forest inventory procedures. As a result, increases of some 75 million board feet in the annual allowable harvest of western Oregon timber lands administered by the Department of the Interior have been made possible.

## *Broad New Conservation Plan*

As a further significant result of the 18-month moratorium order, he Department has submitted to Congress a comprehensive program or modernization of public land laws, establishing new authority to nanage and develop the public lands natural resources.

Here emphasis has been placed on legislation which will authorize ublic lands not needed for public purposes to be leased or sold and to e transferred to private ownership as residential and business sites or o meet the needs of a modern industrial and urbanized society. Attention has also been given to bills which will simplify administrative

*The public lands of the West can provide growing space for rapidly expandin urban and industrial land requirements. The Department is seeking legi lation to permit orderly transfer for these purposes.*

procedures for exchanges of public lands with States and individua and to eliminate outmoded features.

The 5-year program—with projections to 1980—recommends maj expansions of conservation projects on the public land reserve an accelerated efforts to provide recreational facilities, halt soil erosio and protect forest resources. Reseeding and brush control program on public ranges will be stepped up and fences and water-control pro ects will be increased. Timber stand improvement activities, suc as reseeding, thinning, and pruning, will be accelerated.

One of the major elements of the plan is the development of 1,45 recreation sites on public lands. Related to this and other element of the program is the proposed building of more than 3,000 miles access roads before 1967.

The cost of the first 5-year phase of this comprehensive program i estimated at about $478 million. During the same period, publi land revenues will total about four times as much—almost $1. billion.

## *Forest Planning*

The Department of the Interior administers some of the mos valuable Douglas-fir forests in the world. To assure their highes use and production, the Department in fiscal year 1962 undertook th

*o assure their highest use and productivity, the Department has undertaken*
*e development of an intensive new forest management program for forest*
*nds under its jurisdiction.*

evelopment of an intensive new forest management program, in-
uding the application of long range planning techniques. Features
the program include harvesting of immature timber which would
dinarily be lost to growth competition, and an accelerated reforesta-
on project to bring denuded commercial forest lands into full pro-
ıction by 1970 and assure their sustained production.

In another step to improve forest yields and expand business op-
ɔrtunities, the Department, in cooperation with the Small Business

Administration, has arranged for loans to small firms for constructi of access roads to timber sale areas. By using these loans, small firms are able to compete on larger sales where considerable amour of capital outlay are needed to develop access road systems.

Other pending changes in timber sale regulations designed to a forestry include longer contract periods, reduction of performan bonds, cutting timber in advance of payment, and the allowance installment payments on sales valued as low as $500.

## *Range Resources*

For the first time the need to reverse the trend of deterioration a to build toward full sustained-yield production of the 194 million acr of range resources administered by the Department has been plac in perspective as a major national problem.

An evaluation of the needs of the western rangelands has sho that more than 100 million acres require an immediate and intensi stepping up of conservation programs if the process of rehabilitati is to be begun.

To cope with this large-scale problem, the Department, sin January 1961, has accelerated its program to improve range manag ment, with particular emphasis on range use supervision, trespa control, and range studies.

In both 1961 and 1962, the Congress approved supplemental appr priations—the first ever granted—for work toward rehabilitation vast burned-over range areas, and in fiscal year 1963 funds for t purpose have been made a regular part of the soil and moistu conservation budget.

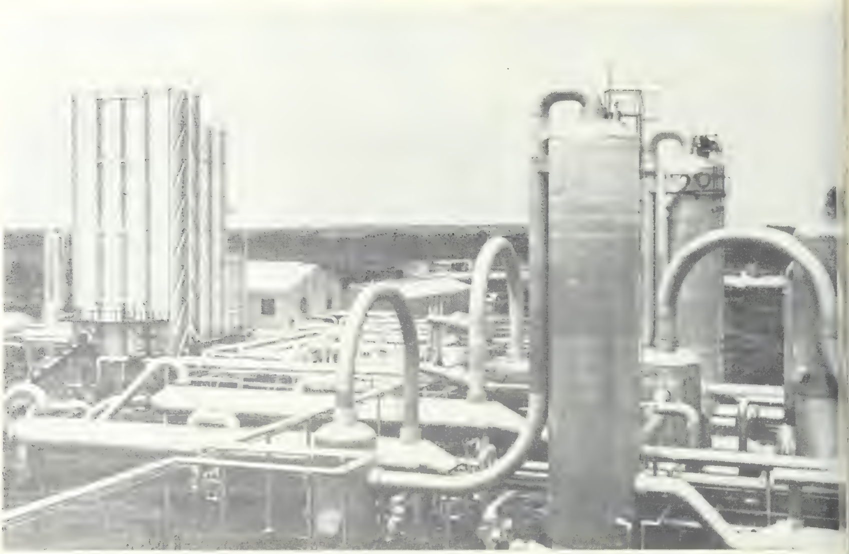
Over 500,000 acres of rangelands have received conservation trea ment in the form of such projects as brush control, seeding, wat control structures, stockwater developments, and fences. A compr hensive weed control program has proceeded as rapidly as money a manpower will allow under cooperative Departmental research pro ects conducted by the Agricultural Research Service of the Depar ment of Agriculture and by State universities in several of the Stat as well as direct control measures on the ground.

As a forerunner to a full-scale appraisal of the public rangeland the Departments of Agriculture and of the Interior conducted a tri appraisal program on lands administered by the two agencies Colorado, Montana, and Oregon. Undertaken at the request of t Senate Appropriations Committee, the study included such facto as suitability for livestock grazing, past and present managemen range condition and trend, current and potential grazing capacit range use by livestock and wildlife, and existing and needed conserva tion practices and improvements.

*epartment's accelerated range management program has provided more an 500,000 acres of rangelands like these with conservation treatment in e form of such projects as brush control, seeding, water control structures, ckwater developments, and fences.*

## *Mineral and Energy Resources*

In the past 30 years, this Nation has consumed more minerals than the peoples of the world had previously used. Twice during those ree decades we have doubled the money value of mineral production. at current demands are being met without difficulty is primarily



*The Northern Natural Gas Co.'s plant at Bushton, Kans., is first of five constructed by private industry in Department's expanded helium conservatio program.*

due to the immense technical and exploratory efforts of the 1940's an early 1950's. But with national requirements constantly increasing the present availability of raw materials will not continue unles prompt action is taken to look to the years ahead.

Since January 1961, this Administration has given strong suppor to legislative proposals designed to assure that the multiplied needs o the future will be met.

A clear example of these needs may be seen in the growing nationa requirements for, and shrinking supplies of, helium.

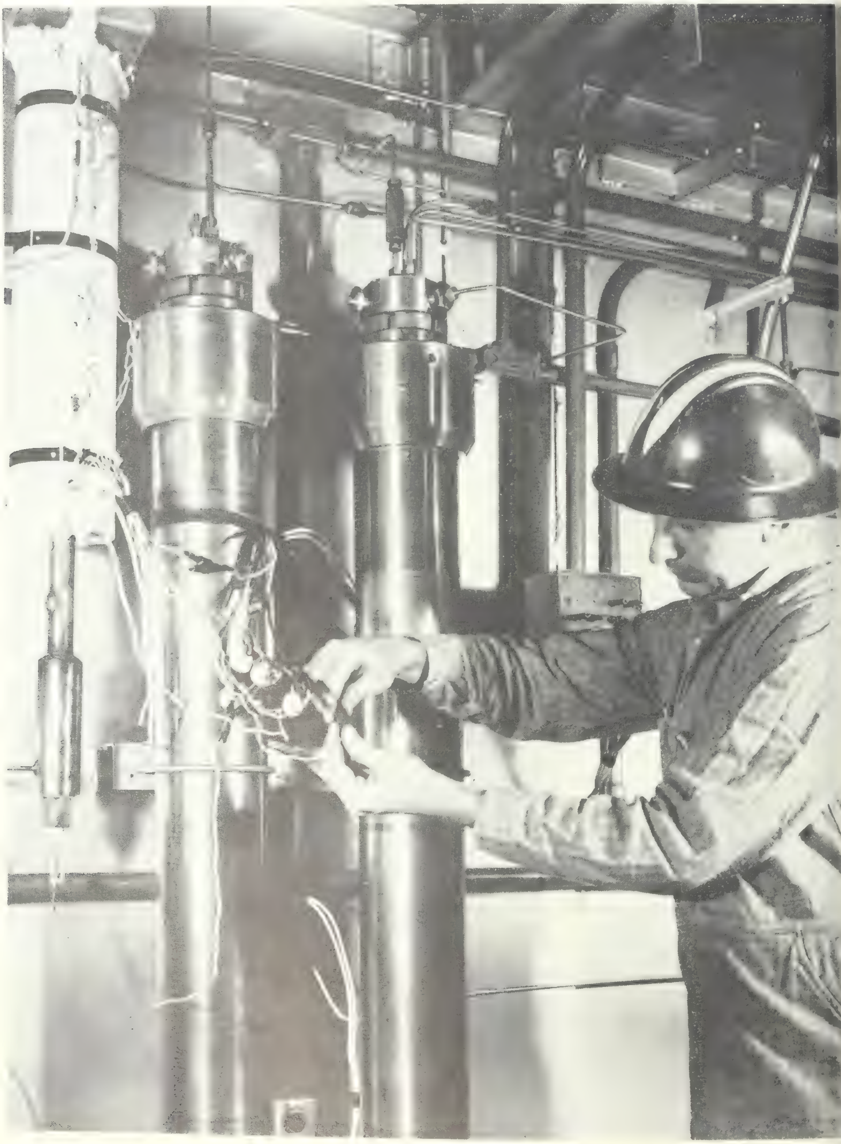
Protection of our irreplaceable helium resources has become increasingly important with growing use of this element in space age an nuclear technology, and in cryogenics—the rapidly expanding field o low-temperature research. Helium's unique properties of lightness inertness, low-liquefaction temperature, and transparency to radioactive particles have caused a phenomenal upswing in demand durin the past 10 years.

Helium occurs as a minor constituent of some natural gases and i extracted by a low-temperature gas liquefication process. Unles helium is extracted from the natural gas, it is wasted when the gas i burned. In the last two decades no new sources of helium have bee found comparable with those previously known. Because of this, th Bureau of Mines is extracting as much helium as is feasible and storin it underground in a depleted natural gas field. Without this program bout 5 billion cubic feet of helium would be wasted annually in atural gas used for fuel.

The 1st session of the 87th Congress authorized expansion of the epartment's helium conservation program and, in little more than year following this action, contracts totaling $47.5 million annually r up to 22 years were awarded under which private industry has greed to build and operate five plants to extract and thus prevent aste of helium in marketed natural gas. The first of these plants

*ureau of Mines has completed 430-mile pipeline system to carry newly saved elium to underground storage in Texas.*

was placed in operation, delivering its output to a 430-mile, $8 million pipeline system just built by the Bureau of Mines. The n pipeline will connect all of the five new plants with four of the Burea production-and-purification plants and with the Cliffside gasfield ne Amarillo, Tex., for underground storage. The remaining four n plants are scheduled for completion by early 1963, and the five n



*Progress in efforts to find new uses for coal is marked by this experimenta equipment for converting coal into oil.*

stallations combined will deliver more than 3 billion cubic feet of elium annually to the pipeline-storage system.

Additionally, the Bureau of Mines has made considerable progress research on minerals processing and utilization, including prepara- on of steel from pyrophoric iron powders and preparation of extra- dinary pure nickel and rhenium metals by solvent extraction ectrolytic combination processes.

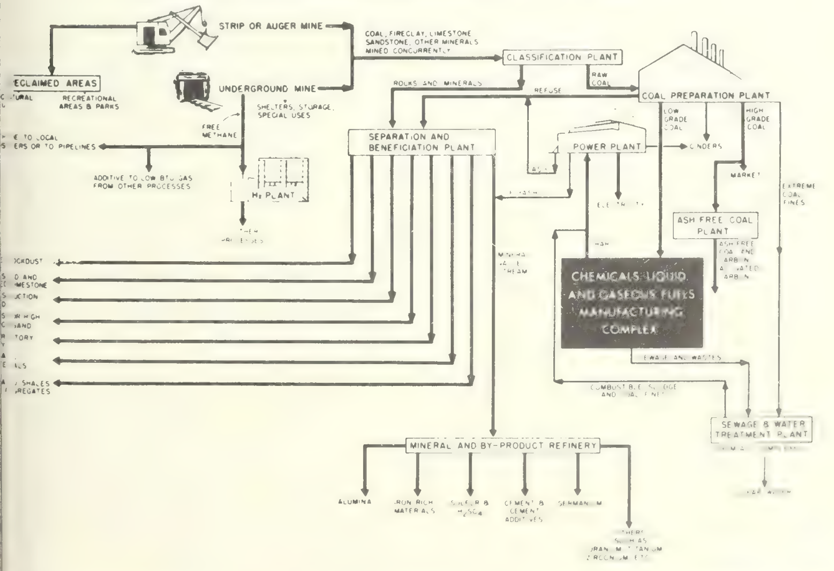
## oal—An Awakening Giant

While there are no easy answers to the many complex problems the field of energy, major moves have been taken in recent months ith the intent of expanding the use of the Nation's great coal re- rves. Since January 1961, more emphasis has been placed on forts to improve the position of the Nation's coal industry than at y other time in recent years.

One of the most significant steps in this direction was taken with tablishment in the Department of a new Office of Coal Research, signed to complement the continuing research programs of the ureau of Mines with the particular aim of achieving breakthroughs here possible on a short-range basis.

POTENTIAL MULTIPLE-PRODUCT MINING COMPLEX

OFFICE OF COAL RESEARCH, DEPARTMENT OF THE INTERIOR



*e of the major efforts of the Department's new coal research program is to velop new ways to utilize fully all of the economic value in a ton of coal— energy, chemical, and byproduct content—as shown above.*

The interest stimulated by this action is shown in the fact tha since its establishment, the Office has received more than 250 researc proposals from private companies, individuals, research organization and educational institutions. In fiscal year 1962, contracts with total value of nearly $3 million were granted for research in the fiel of coal production, utilization, processing, equipment, and transport tion.

At the same time, continuing progress has been reported by th Bureau of Mines in major coal research projects, including hydrauli mining, conversion of coal to high B.t.u. gas, development of practical coal-burning turbine engine, and conversion of coal to liqui and gaseous fuels.

## *Breakthrough in Transportation*

One of the major disadvantages of the coal industry in attemptin to compete in the energy markets with other fuels has long been th problem of transportation.

A possible breakthrough in this regard may be found in the relativel recent development of a coal slurry—a mixture of coal and water— which can be fed directly into boilers for producing steam to generat electricity.

This slurry is capable of being transported through pipelines simila to those used for oil, and proposed new legislation would facilitat the construction of interstate pipelines—through Federal use of th right of eminent domain and by other means—to transport slurr from minemouth to large energy users.

Interior Department technicians conducted a study for th President's Panel on Civilian Technology which demonstrated that the pipelining of coal could have a healthy effect on the coal industry. Among benefits could be substantial improvement of economic conditions not only in the coal industry but in many coal mining communities that presently are in a seriously depressed condition.

## *Other Highlights*

Meanwhile, other highlights in the Nation's minerals conservation progress since January 1961 included:

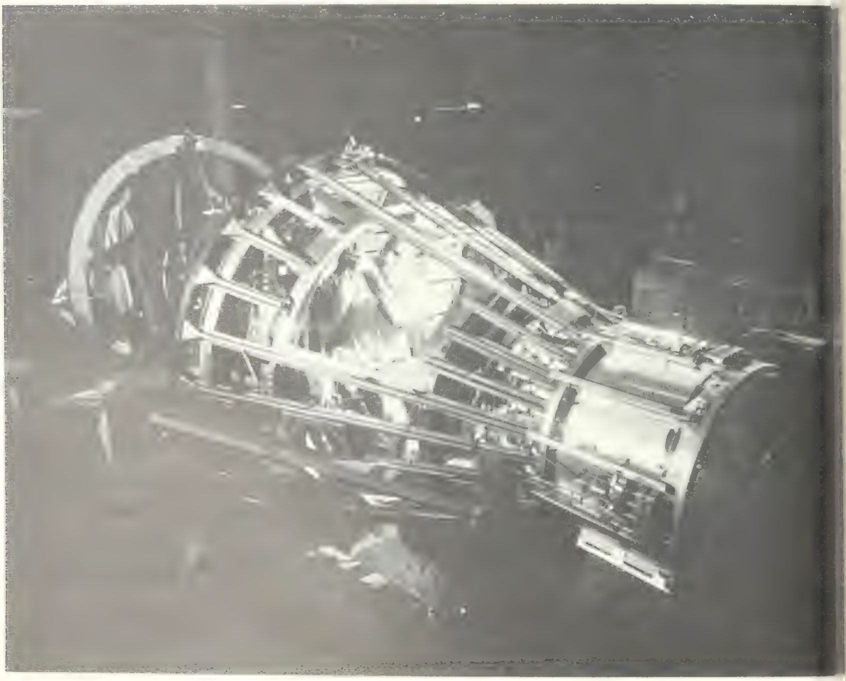
—The first Federal mineral leasing on the Pacific coast Outer Continental Shelf marked a conservation landmark when some 80,000 acres of submerged lands off the coast of southern California were offered for competitive phosphate leasing. Also, large blocks of Outer Continental Shelf lands off the gulf coast—including nearly 2 million acres off Louisiana and Texas—were leased for oil and gas exploration with bonus bids totalling more than $445 million—the largest amount ever received in a single Federal lease opening.

—In another pioneering step contributing both to conservation and the national security, the Department completed preparations for the opening of bids in January 1963 covering the first lease-sale of Federal oil and gas lands off the coast of California. Development of the oil resources covered by this sale will provide a significant stimulus to the economy of northern California while adding to vital national emergency reserves.

*Development of oil potential of Outer Continental Shelf lands in Pacific Ocean and Gulf Coast is being accelerated by the Department of the Interior.*

— Fiscal year 1962 applications for minerals explorati assistance increased 175 percent over 1961 following the revisi and streamlining of Office of Minerals Exploration regulatio including the addition of gold, silver, and iron ore to the eligibili list.

— The Department's Geological Survey discovered new deposi of beryllium ore in the Lost River area of Alaska, about 70 mil northwest of Nome. Beryllium, a scarce metal worth appro mately $70 a pound, is valuable as a strengthening and hardeni material when alloyed with copper and nickel and also has co siderable potential for use in supersonic planes, space craf missiles, and nuclear reactors.



*Titanium metal, produced with techniques pioneered by the Department Bureau of Mines, was used in the framework and "skin" of the Mercur capsule's cabin, helping to shield astronauts from the high temperature encountered in the frontiers of outer space.*

— Oil and gas exploration, development, and production i Alaska has experienced a sharp increase, particularly on the Kena Peninsula, in a development expected to stimulate the economi growth of that State and provide additional incentive for furthe mineral exploration.

— The Bureau of Land Management has begun an inventory of the known mineral resources and potential minerals areas under the Department's administration to provide a basis for a more effective management program.

— The Geological Survey inaugurated a long-range geologic mapping program to provide information for the classification of Federal lands valuable for such leasable minerals as coal, oil shale, oil and gas, phosphate, potash, and sodium, with the objective of making some 50 million acres of withdrawn Federal lands subject to public land laws.

— Reopening of the Government's experimental oil shale plant at Rifle, Colo., an important link in efforts to find new uses of oil shale through concentrated research, was authorized by the 2d session of the 87th Congress.

— Action was taken to strengthen the oil import control program. Provision was made for "new comers" to obtain allocations of residual fuel oil based upon terminal throughputs, whereas previously the program was limited to historical importers. The crude oil import program was made more responsive to the needs of the oil industry by reducing the number of steps in the sliding scale for allocation holders on "refinery inputs" basis from eight to four.

## *Indian Affairs*

In the past 2 years this Administration has moved forward rapidly a new program for the Indians which places emphasis on preparing e Indian population for full, equal participation in all aspects of r national life.

President Kennedy outlined his views on Indian policy soon after s election when he said: "We want every group which is now unable make its full contribution to American strength to be given the portunity to do so. It is in this spirit that we shall approach r work on Indian reservations, and it is in this spirit, I am sure, at Indians throughout the country will work together for a better e for themselves and thus a stronger America."

In February 1961, a special task force was appointed by the Department to make a thorough study of the problems and programs fecting the lives of the 380,000 Indians still receiving services om the Bureau of Indian Affairs, and to put forward recommendaons looking toward "a better life" for these Americans.

In July of that year, the task force—after traveling 15,000 miles d conferring with the representatives of 200 organized tribes—mpleted its report. The comprehensive document recommended programs and actions designed to blaze a new trail in India development.

Probably the most significant paragraph of the report was thi

> "The task force believes that in the foreseeable future, tl proper role of the Federal Government is to help Indians fin their way along a new trail—one which leads to equal citizei ship, maximum self-sufficiency, and full participation in America life. In discharging this role, it must seek to make availab to Indians a greater range of alternatives which are compatib with the American system, and, where necessary, to assist Indiai with choosing from among these alternatives. As a part of th responsibility, it must mobilize and direct the vast reservo of good will toward Indians which is found throughout tl country."

## *Highlights of Progress*

Prompt action to implement the task force recommendations cam not only from the Department but from the Congress. The subsequent 18 months of record progress toward self-sufficiency have bee marked by these highlights:

— Under the Area Redevelopment Act, 56 reservations an four areas in Alaska—containing about two-thirds of the tota Indian population—have been made eligible for special aid t assist in overall economic development. Some 50 Indian tribe have applied for ARA grants for studies of economic developmen possibilities, and in fiscal year 1962 a total of 19 research contract were let, involving a commitment of $720,000, with particula emphasis on the development of new recreational and touris attractions. Included in the ARA studies now underway is project to determine improved methods for expanding th Alaskan native arts and crafts market.

— The Bureau of Indian Affairs' adult vocational training program has been accelerated and expanded as the result of actio by Congress increasing the authorized amount of appropriation for the program from $3.5 to $7.5 million annually.

— Similarly, an increase from $10 to $20 million in authorize appropriations has made possible substantial expansion of th Bureau's revolving credit program for Indians.

— The program of school construction on reservations has bee considerably accelerated, with the provision of facilities for al Indian children needing educational opportunities now schedule for the end of fiscal year 1965.

*dian educational opportunities are being expanded. This class at Eagle utte, S. Dak., is in a school jointly operated by the Bureau of Indian Affairs d the local public school district.*

— A new milestone in Indian education was reached with the opening in Santa Fe, N. Mex., of the Institute of American Indian Arts. Current enrollment of about 150 students in the 3-year high school and 2-year postgraduate course includes Indian young people from all parts of the United States. An additional 180 students are continuing with regular academic studies at the school in 1962–63. The institute offers a regular high school curriculum plus special training in applied and creative arts.

## *n-Job Training*

— Since the summer of 1961, the Bureau of Indian Affairs has been making greater use of work forces which it recruits and supervises directly for construction work on schools, roads, irrigation projects, and other facilities. Previously, all such work was done by private contractors who recruited and supervised their own work forces. The major advantage of the new method

*Indian woman working on rug is symbolic of departmental efforts to devel and protect Indian art as unique cultural craft.*

is that it provides local Indians with more employment oppo tunities as well as providing on-the-job training in the use heavy equipment and in other phases of construction work.

— The Department and the Federal Housing Administratic have entered into an agreement designed to increase the avai ability of FHA-insured financing for home construction ar housing improvements on reservations. In addition, approv was given by the Public Housing Administration for a low-re public housing project on the Pine Ridge Reservation in South Dakota—the first such project on Indian lands—and similar projects on other reservations are in the planning stage.

## Territorial Progress

The territories under U.S. administration have made substantial
ogress since January 1961 under the Kennedy Administration policy
promoting self-government and encouraging expanded social and
nomic development.

Congressional support of the President's endorsement of programs
ommensurate with the responsibilities of our stewardship" was re-
cted in legislation raising the appropriations ceiling for the widely
ttered islands of the Pacific Trust Territory from $7.5 to $15 mil-
n in 1963, and $17.5 million thereafter. A major result of this action
s been the acceleration and expansion of programs of the Depart-

*rovement of agricultural development is one of Department's principal*
*s in territories under its jurisdiction. This is an example of nut clusters*
*choice mother palm tree in Yap District, Trust Territory of the Pacific.*
*Yap Islands are a particularly good source of seednuts. Trees are*
*cted and marked as sources of nuts for planting throughout the Territory.*

ment's Office of Territories to provide increased educational opp tunities for the islanders.

An important step toward the development of competent se government also was taken with establishment of a new capital of t Trust Territory—including the Marianas, the Marshalls, and t Carolines—on the island of Saipan.

## *Guam Restrictions Lifted*

Following negotiations between the Departments of Interior a Defense, security restrictions which have hampered tourism and ec nomic growth have been lifted for Guam and considerably lighten for the Trust Territory. Through Presidential action, Navy securi clearances no longer will be required as a condition of entering t territory of Guam, thus providing the same freedom of movement th exists in other parts of the United States. Additionally, the Preside directed the Secretaries of State, Defense, and Interior to devel revised procedures which will facilitate free entry of U.S. citizen U.S. investment, and U.S.-flag vessels into the Trust Territory.

*Pago Pago Harbor in American Samoa, one of the most beautiful in the worl now shines with new buildings on waterfront.*

## *ther Highlights*

Following are additional highlights of territorial progress:

— A new $4.5 million jet airstrip on Samoa—designed to open the way for tourist development—has been placed in operation. Jet service to Samoa reduces by half the previous 8-hour travel span from Hawaii.

— Three new high schools have been completed on Samoa and preliminary work is underway on 5 new junior high schools and 20 new elementary schools in an accelerated educational program made possible by a Federal appropriation of $9.6 million for the island in fiscal year 1962, more than 4 times the amount previously available. Eleven miles of modern roads, first on the islands, have been completed, new electrical generating equipment has been installed, and additional road, hospital, and sanitation facilities are on the drafting boards.

— The new College of Guam, providing higher education for Guamanians as well as students from the trust territory, is now in operation, and progress is being made toward elimination of a dual wage situation whereby Guamanians have received less than U.S. employes doing similar work.

## *Food From the Sea*

Hunger is the greatest human problem facing the world today. ore than half of the world's population—some 2 billion people— ffer from a lack of food supplies which are adequate in quality and antity to sustain desired levels of health, growth, and vigor. And e problem will be vastly intensified by the year 2000 when the esent world population shall have more than doubled.

Widespread malnutrition, and undernutrition, is largely due to in- equacies of high quality protein in the human diet. The only adily available source of inexpensive animal protein in sufficient antities to remedy this diet deficiency is in the sea in the form of h. Fish can supply these diet deficiencies in the form of concen- ated protein. Wisely utilized and managed, the sea with its vast h populations represents an almost unlimited reservoir of high ality animal protein.

In his 1961 message on natural resources, President Kennedy gave pecial emphasis to this point when he said:

> "The sea around us represents one of our most important but least understood and almost wholly undeveloped areas for extending our resource base . . . Salt (and fresh water) fisheries are among our most important but far from fully developed reservoirs of protein foods. At present levels of use, this country

*Departmental oceanographic research programs help to assure catches li this for Nation's fisheries industry.*

alone will need an additional 3 billion pounds of fish and shellfis annually by 1980, and many other countries with large-sca protein deficiency can be greatly helped by more extensive u of marine foodstuffs.

"But all this will require increased efforts, under Federal leade ship, for rehabilitation of depleted stocks of salmon and sardin in the Pacific, groundfish and oysters in the Atlantic, lake tro and other desirable species in the Great Lakes, and many othe through biological research, development of methods for passi fish over dams, and control of pollution.

"This Administration intends to give concerted attention to our whole national effort in the basic and applied research of oceanography. Construction of ship and shore facilities for ocean research and survey, the development of new instruments for charting the seas and gathering data, and the training of new scientific manpower will require the coordinated efforts of many Federal agencies."

## *Action Set in Motion*

In implementation of the President's suggestions, Government and many private agencies engaged in the marine sciences have embarked on a long-range program of oceanographic research. This large and important undertaking is being coordinated by a special Interagency Committee on Oceanography. The work of this Committee is designed to meet the divergent needs of commerce, defense, atomic energy development, and production of mineral and fishery resources.

Four Bureaus of the Department of the Interior are taking a significant part in this new program: the Bureau of Mines, Sport Fisheries and Wildlife, Commercial Fisheries, and the Geological Survey. The Bureau of Commercial Fisheries, being responsible for support of the fishing industry and for development of sea food resources, has a large share of the Department's marine sciences program. In this work, it operates in close collaboration with the Navy Department, the Atomic Energy Commission, the National Science Foundation, and other agencies in Government and the various State and private research institutions.

## *Fish Protein Concentrate*

Apart from the purely humanitarian issues, there are other compelling aspects to what represents the greatest and most interesting challenge in this substantial new program—that of helping to find answers to the world's hunger problems. For example, the mass-scale production of a satisfactory fish protein concentrate would provide a tremendous economic stimulation for our domestic fishing industry. Production of fish protein concentrate would help to diversify the markets of our industrial fisheries. It would assist in restoring the ecological balance of the oceans by utilizing the many species of fish now ignored or wasted by commercial fishermen. It would provide a market for the great quantities of fish inadvertently taken along with the more valuable varieties and are now discarded at sea because no markets exist for them. In many areas, glut periods lower the price of even the valuable catch and frequently, even for these desirable species, no market is available. If, however, the processor were able to manufacture fish protein concentrate durin these periods of surplus, markets would tend to stabilize, and hungr people in all parts of the world would benefit.

Today, as the result of concentrated research, a final breakthroug in the development of a fish protein concentrate satisfactory to th requirements and needs for quantity production and distribution ap pears close at hand.

## *Congress Increases Appropriations*

Closely allied with the problem of meeting world food needs, an with finding new markets and uses for our fishery products, is th problem of finding ways and means of catching fish more efficientl of knowing where they are, and determining the factors which hav a bearing on their abundance.

With increased appropriations provided by the Congress, consider able progress is being made in obtaining the ships and shore facilitie needed for modern fishery oceanographic research on the scale no being undertaken.

Funds were budgeted to the Bureau of Commercial Fisheries t build a new laboratory at La Jolla, Calif., and to make improvement to existing laboratories at Auke Bay, Alaska, Oxford, Md., an Boothbay Harbor, Maine. In addition, a new sea-water system an building for experimental studies on fish and shellfish has been com pleted at the Galveston, Tex., laboratory. A new 180-foot biologica and oceanographic vessel has been launched at Slidell, La., for opera tion in Atlantic waters, and plans are being developed for new researc vessels for use in the Central Pacific, in the North Atlantic, and i the Gulf of Mexico. Additionally, funds are budgeted in fiscal yea 1963 for a new oceanographic ship for operation in Eastern Pacifi waters and for a $2 million laboratory at Seattle, Wash.

To increase the supply of trained oceanographers and fishery biol ogists and technologists needed to undertake this research, the Burea of Commercial Fisheries has set up a program of grants for trainin of graduate students in universities throughout the country. Thi will provide financial support to about 17 graduate-level student during the 1962–63 academic year, and it is expected that this num ber will be increased in succeeding years.

## *New Research Starts*

While emphasis has been given in the early phases of the oceano graphic program to improvement of facilities and increasing scientifi manpower, important new starts in research also have been made.

Initiated this year were expanded studies of gulf estuarine waters These waters are potentially as productive as much of our farmland

*ureau of Commercial Fisheries research vessel is part of Department's rowing oceanography program*

ut we have not yet developed methods of culture that will permit aximum use of their potential. Biologists have learned that these reas serve as nursery grounds for larvae of many varieties of com-ercial species of shrimp and fish which are taken as adults in the ffshore waters of the Gulf. They also provide a large portion of the ation's oyster supply. Fishery scientists have advocated studies of stuarine waters for the past several years because they have been oncerned about the loss of this environment through the dredging f channels for real estate and other commercial developments. The oal of this new research is to determine if these engineering develop-ents are harming resource production and, if so, to find ways to revent it.

A new program of oceanographic research in the tropical Atlantic cean is being organized this year. The objective of this activity is o investigate the fishery potential in this important region. The rst fieldwork will be on the eastern side of the Atlantic to define the nvironment in which important high-seas tuna populations and other aluable fishery resources are known to exist.

*Gill nets are part of equipment used in Department's high seas salmo research program.*

## *Alaska Salmon Research*

Information necessary for successful renegotiation of the International North Pacific Fisheries Convention is the objective of a emergency salmon research program in Alaska. The convention– between Japan, Canada, and the United States—became effective i 1953, and may be terminated, amended or continued in 1963. Th research program, undertaken by Bureau of Commercial Fisherie laboratories and with contract work being done by the Alaska Department of Fish and Game and the Fisheries Research Institute o the University of Washington, is nearing completion. It has increased our knowledge of optimum spawning escapements, carryin capacity of lakes, and spawning characteristics necessary to suppor the Bristol Bay red salmon runs.

High seas salmon research reached maturity with emphasis on hig seas tagging and sampling. This has provided new information o locations and ocean migration habits of different stocks of salmon.

The proposed development of the Middle Snake River, an importan tributary of the Columbia River, resulted in a new program oriente to the problem of fish passage, posed by construction of high dams

The State fisheries agencies of California, Idaho, Oregon and Washington are cooperating with the Bureau of Commercial Fisheries in developing techniques and equipment, and in research.

### *Great Lakes Rehabilitation*

One of the most encouraging developments to the commercial fishing industry has come in the Great Lakes where a large-scale sea lamprey invasion had for some years all but put an end to the highly profitable lake trout catch.

Today, a two-pronged attack on the predators gives promise that full-scale lake trout fishing may be restored. Under the auspices of the International Great Lakes Fishery Commission, the Bureau of Commercial Fisheries and the Fisheries Research Board of Canada treated with a selective toxicant all tributary streams of Lakes Superior and Michigan known to contain larval sea lampreys. This major experiment in chemical control of an undesirable species shows every promise of ultimate success.

At the same time, artificial propagation has been used to restock Lake Superior with lake trout. Survival of hatchery-planted trout is excellent and growth rapid, indicating a promising future for rehabilitating the lake trout fishery.

## *International Cooperation*

Since January 1961, this Government has been seeking, more earnestly than ever, to promote the conservation of natural resources in foreign countries. The two basic reasons for this renewed emphasis are quite obvious: First, these activities further the objectives of the U.S. foreign aid program through helping millions of free people find their way to a better life; and, second, they also help assure adequate future supplies of raw materials which the United States must seek abroad.

The views of the Kennedy Administration in this regard were expressed by President Kennedy when he said: "Just as our investment of scientific talent, money, and time is better utilized in well coordinated and complementary programs within the Federal Government and by the closest working relationships with State and local governments, the academic community and industry, so our efforts should be meshed with those of the other countries of the world.

> "Resource conservation problems are world-wide; efforts to solve them should be equally universal. This Nation will continue to cooperate in international scientific and research undertakings and the useful information and specific technological applications

we develop—economically feasible desalinization of sea water, f example—will be made available immediately, as has always bee our practice, to advance the welfare of all peoples of the world.

## *Mineral Conservation*

The expanding scope of our efforts in this field are particularl evident in international collaboration in minerals programs. Despit the richness of its domestic resources this Nation is notably deficien in certain minerals. Working in cooperation with the Agency f International Development, engineers of the Bureau of Mines ar making substantial progress in helping to advance the developmen of mineral resources abroad.

Throughout our industrial history, we have depended on foreig sources for our tin supplies. One of the major world producers of thi metal in Indonesia, where recent serious declines in mining efficienc have threatened the industry's ability to continue as a leading producer. Bureau of Mines engineers on technical assistance assignment in Indonesia have repeatedly advocated detailed study of the industr to determine the best solutions to its difficulties. Their efforts no have borne fruit. An American consulting team has been assigned t undertake a comprehensive study of all facts of Indonesian tin mining and this investigation is presently well underway.

*The Department is assisting in mapping vital Pakistani coal-rich regions. More than 150 Department technicians are presently assigned to 30 nation to help in the development of natural resource programs.*

To provide the energy production that is essential for advancing the economic status of underdeveloped countries, Bureau of Mines technicians have helped improve the utilization of native coal resources in several countries. In Afghanistan, for example, the Bureau's efforts have resulted in a new mine, using modern methods, which is now coming into production. Fuel shortages no longer will plague the country during severe winter months, and sizable quantities of coal will be available for the creation of small local industries in that landlocked nation. Similar achievements are being realized in Indonesia and Taiwan.

Bureau engineers have been successful in creating new industries in other free-world countries. In Mexico, a long dormant copper deposit has been brought to the verge of commercial operation through metallurgical research conducted by Government laboratories under the guidance of a Bureau metallurgist. In Korea, Bureau efforts to develop iron-ore resources have helped expand production, which now is supplying growing local needs and also providing a surplus for export.

## *Other Assignments*

Our cooperation with nations abroad in resource conservation and development projects is by no means limited to the field of minerals. Recent assignments of Department experts include:

— A four-man Bureau of Reclamation team of engineers and agricultural experts will assist in evaluating proposals for water development in the Piranhas River Basin in northeastern Brazil, an area of extreme and persistent drought.

— In response to a request from the Inter-American Development Bank, the Bureau of Reclamation is providing the services of an engineer to advise on problems connected with the important Villamontes irrigation project in Bolivia.

— Seven engineers of the Geological Survey are conducting field surveys in Antarctica for topographic mapping in connection with the 1962–63 U.S. Antarctic research program.

In total, more than 150 Department technicians are presently assigned to 30 nations to help in the development of natural resource conservation programs. They are helping to solve water-control problems of the Blue Nile Basin in Ethiopia, assisting Pakistani geologists in a countrywide assessment of mineral and fuel resources, and encouraging the working of untapped resources in such widely separated countries as Thailand, Turkey, and Peru.

At the same time, hundreds of trainees from scores of foreign countries are studying in Department laboratories, pilot plants, and research stations under the tutelage of Americans working to share th knowledge with fellow scientists from all parts of the globe.

Contributions by researchers of the Department's Bureau of Co mercial Fisheries contributed importantly to the success of the FA International Conference on Fish in Nutrition held in September 19 in Washington, D.C., and attended by more than 300 scientists fro 35 nations and international organizations.

Also, Bureau vessels and personnel will participate in the inte national cooperative investigations of the tropical Atlantic, a joi program of several nations concerned with an oceanographic study the waters of the Atlantic Ocean between South America and Afri in 1963.

## *Conclusion*

The world has undergone mighty changes since the days of the ear conservationists. Enormous population gains and swift technologic development have combined to create resource pressures which wou have been totally inconceivable even a few decades ago. The tw Roosevelts will live in history for their accomplishments in the fie of conservation, but the bold new programs associated with the terms of office would be far from adequate to cope with the alter needs of today—or the multiplied needs of tomorrow.

In the past it was sufficient to concentrate on resource managemen to curb waste and destruction. Today, while these elements of co servation remain essential, a vital new factor has been added—th need to apply the great discoveries of science to the task of "creatin" new resources and enlarging the use of those existing.

There can be no question that scientific and social research mu be the bedrock of our planning and action programs in the time ahea Our investment in conservation research now will determine th environment in which our children will live, and the growth potenti of the economy they inherit. The leaders of private industry a wisely making huge investments in research, but the responsibility f basic conservation research must fall heavily on government; firs because governments must consider a longer time span than indivi uals; and, second, because governments can best take account of th uncertainties of the future.

### *The Need for Knowledge*

Research as a basis for planning and action is nowhere bett illustrated than in the problem of water resources. We do not y have adequate knowledge to be able to predict the effects of upstrea

*ncreasing interest by young Americans in conservation education means rained scientists for the future.*

evelopments in a river basin on downstream regulation and use; or do we understand the long-term effects of flood control measures n the natural regime of streams and flood plains, or the behavior of round water reservoirs.

To find the highest and best uses of known resources, we need better ays to combine the tools of economic projection and physical esearch.

It was for this reason—and to attune Departmental programs as apidly as possible to the new age of scientific ascendancy in conserva- ion—that the Department in 1961 announced appointment of a cience Advisor to the Secretary.

## *he Role of Young People*

While giving increasing emphasis to scientific development, we must lso keep in mind the fact that education is the key both to the tech- iques and the ethic of conservation. We must produce more young eople with the skills needed for resource development, broad knowl- dge of the social, economic and technical factors that play upon each other in this field, and the idealism and farsightedness that will give them a deep concern for the future.

Further, one or our most pressing needs is the establishment of a Youth Conservation Corps to conserve and develop the capacities of our two most precious national assets—our youth and our natural resources.

The Youth Conservation Corps, as supported by the Administration, would provide for agreements with Federal and State agencies for the use of Corps trainees in carrying out conservation programs of those agencies. It would provide employment on useful work that gives dignity to those performing it—and it would instill in our youth an appreciation of the natural world and an understanding of the land and our dependence upon it.

## *Substantial 2-Year Progress*

Obviously, a great deal remains to be done in fulfilling our national conservation goals.

But the progress of the past 2 years has placed us well on our way toward a record of achievement unmatched since the Administrations of the two Roosevelts.

If current momentum is maintained—and it appears certain that it will be in the years immediately ahead—the Nation can feel a new confidence in the adequacy of natural resource supplies to meet the rapidly growing needs, both of today and tomorrow.

As President Kennedy has said, if we continue on our present course we can not only repay our debt to the past, but meet our obligations to the future.

# *Part II*

# *Annual Reports of the Bureaus and Offices of the Department of the Interior*

# Office of the Secretary of the Interior

## Stewart L. Udall, *Secretary*

## James K. Carr, *Under Secretary*

The Secretary of the Interior—as head of a major executive department of the Federal Government—serves as a member of the Cabinet of the President of the United States and the principal Federal executive officer charged with the administration of programs o conserve and to develop the natural resources of the United States.

The Secretary—assisted by the Under Secretary—directs and upervises the activities of the 24 bureaus and offices of the Department of the Interior. The Under Secretary, with the exception of ertain matters requiring the personal attention of the Secretary, has the full authority of the Secretary on any matter which comes before him.

The responsibilities of the Secretary include:

— *Management* of some 553 million acres of public-domain lands and mineral leasing responsibilities for all other federally owned lands, as well as on the Federal areas off the coasts of our Nation.

— *Marketing* of electric power from plants with an installed capacity of about 12 million kilowatts, derived from federally constructed water, and flood, and navigational projects.

— *Providing* irrigation water for more than 8 million acres of agricultural lands in the arid and semiarid West which, for the most part, produce high-quality nonsurplus foods and fibers, worth $1 billion annually.

— *Exercising* Federal trust responsibilities for about 350,000 Indians, working constantly to improve the natural and human resources of the Indians.

— *Administration,* economic improvement, social and political betterment in the remaining territorial areas of the United States—Guam, American Samoa, the Virgin Islands, and the United Nations-mandated Trust Territory of the Pacific.

— *Increasing* the mineral and fuel potentials of the Nation b assisting technically—and in the case of strategic mineral financially—in developing and improving mining methods a geologic knowledge, and by promotion of conservation throug wise utilization of our mineral and fuel resources.

— *Protecting* and administering almost 200 national park monuments, and historic sites, and creating new recreation areas at multipurpose water resource projects—as well as makir public lands available for recreational needs to States an municipalities and providing planning aids to States. Th various recreational lands and areas of the Department a visited by over 125 million Americans annually.

— *Promoting* the conservation and development of our vit sport and commercial fish populations and natural wildlife r sources and protecting these resources from unnecessary d pletion and selfish use.

— *Surveying* the water and mineral resources of the Natio with an eye to the future and providing for the basic geologi and topographic mapping of the Nation.

— *Directing* and coordinating the national effort to achiev the economical conversion of the waters of the oceans an brackish water into fresh water for human use.

In addition, the Secretary also exercises delegated defense mobil zation responsibilities related to minerals, fuels, electric power, an commercial fisheries.

As the principal conservation agency of the Federal Governmen the Department of the Interior is engaged in activities which dail affect the lives of all Americans. The term, "Interior," is actually misnomer—for the Department should more properly be called th Department of Natural Resources.

Representatives of the Department are at work today around th globe. Employees are engaged in resource conservation activities i every State of the Nation, in our few remaining territorial areas, i the major oceans, at the north and south polar regions, and by invitation in more than a score of foreign countries. The Departmen has major responsibilities in the international field, particularly i foreign trade affecting minerals, fuels, and fishery products.

The Department receives annual appropriations from the Congress The Department also returns substantial revenue to the Federa Treasury and to the States from its resource conservation activities

In recent years, the appropriation of the Department for all purposes has been slightly under $1 billion, and its income from resource conservation and development activities has been about 55 to 6 percent of its appropriations. The annual investment in resourc onservation by the Department continues to create new wealth and o generate new income each year throughout the Nation far beyond he cost of Federal expenditures.

In formulating and administering programs for the management, onservation and development of natural resources, the Department ursues the following objectives: The encouragement of efficient esource use; the assurance of adequately developed resources to eet the requirements of national defense and an expanding economy; he maintenance of productive resource capacity for future genera- ons; the promotion of an equitable distribution of the benefits of ublicly owned resources; the discouragement of wasteful exploitation; nd the orderly incorporation of Indian groups into national life by roviding equal educational and economic opportunity.

In the following pages, the programs of the Department during scal 1962 designed to meet these responsibilities and objectives are escribed.

# Office of the Assistant Secretary
# Public Land Management

## John A. Carver, Jr., *Assistant Secretary*

The Public Land Management segment of the Department's oper-
tion enjoyed a unique experience during this fiscal year: the launch-
ng of a new Bureau to discharge responsibilities recently assumed by
he Department. Within 90 days after the Outdoor Recreation Re-
ources Review Commission submitted its long-awaited report, the
ecretary implemented one of its key recommendations by creating
he Bureau of Outdoor Recreation and appointing Dr. Edward Crafts
o be its first Director.

In large measure, this significant event symbolizes the unique area
f emphasis in land management activities during the year—a year
hich saw more progress toward catching up with the backlog of
ecreation land needs than in any similar period in this generation.
he Cape Cod National Seashore became a legal reality and its basic
rganization was established early in the year; by year's end the Point
eyes and Padre Island National Seashores were on the threshold of
ongressional approval, assured of the enactments which followed
hortly. Large areas of the public domain were set aside for Federal-
tate cooperative development of wildlife resources. Economic sur-
eys and other planning for Indian tribal land development placed
eavy emphasis on recreation potential.

Notwithstanding this emphasis, other programs were moved forward
t a gratifying pace. Substantial progress was made toward agree-
ent with range users on increasing grazing fees to a level more com-
ensurate with the value received. Provision has been made for
quitable settlement with residential occupants of unpatented mining
aims. Assistance to Indian groups has stimulated heightened in-
erest in economic development of reservation resources. The re-
abilitation of American Samoa progressed to the point where it
erved as a source of pride when the Territory played host to the
outh Pacific Commission Conference in July, 1962. New goals have

been established for education, health services and political develo ment in the Trust Territory of the Pacific Islands and the Congre has more than doubled the authorized level of annual appropriatio to achieve these objectives.

The maximum development of America's public land resources r mains a stimulating challenge. The progress made in the past fisc year offers new incentive to push forward to secure for the who people the rich benefits which can flow from the wise use of th common inheritance.

# Bureau of Indian Affairs

## Philleo Nash, *Commissoner*

Early in the fiscal year 1962 the Bureau of Indian Affairs of the epartment of the Interior was provided with a "roadmap" to guide ts future operations in the form of a 77-page report submitted by the ecretary's Task Force on Indian Affairs. At the end of this "New rail for American Indians" charted by the task force were three ime objectives: (1) Maximum Indian economic self-sufficiency, (2) ll participation of Indians in American life, and (3) equal citizenship ghts and responsibilities for Indians. To move toward the accom- ishment of these goals, the task force report recommended less em- asis on the purely custodial functions of the Bureau, greater con- ntration of time, energy, and funds on fostering fuller development both the human and natural resources on Indian reservations.

Viewed as a whole, fiscal 1962 was for the Bureau largely a period reorganization, program planning, and "tooling up" for a heighten- g of development activity on the reservations. With two members the task force (Philleo Nash and James E. Officer) joining the Bureau Commissioner and Associate Commissioner in September, further omentum was given to these trends. In October, the Bureau ought together at Denver, Colo., all of its agency superintendents the first nationwide meeting of these officials since 1938. ter in the year, an administrative reorganization was accomplished— t only in Washington but in area offices and agencies—combining in e new division all operating units directly concerned with economic velopment. Just before the close of the period a series of studies s launched by private research organizations working under con- ct (with funds provided by the Area Redevelopment Administra- n of the Department of Commerce) to determine the feasibility of specific economic development enterprises on the Indian reserv tions and in the native villages of Alaska.

## *Agency Superintendents Meet at Denver*

The meeting at Denver was especially important since it assembl under one roof the policymakers from Washington, the intermedia supervisors from the 10 area offices, and the agency superintende with their direct responsibilities for translating policies and plans in tangible results on the reservations.

Discussion at the meeting was largely focused on the task fo report and the steps necessary for effectuating its major recommend tions. The Secretary of the Interior and the Assistant Secretary f Public Land Management as well as most of the top staff from t Bureau's Washington office actively participated in the conferen

## *Bureau Reorganized for Economic Development*

Reorganization of the Bureau along economic development lin was discussed at the Denver conference and put fully into effe several months later. Under the plans that were finally worked ou all the resource functions of the Bureau (agricultural assistan forestry, real estate appraisals, real property management, road co struction and maintenance) were brought into closer relationship wi the industrial development work and the revolving credit progra within the structure of a new Division of Economic Developme In the Washington office the new Division also included a progra planning staff and a specialist in housing.

In addition, a new position of Economic Adviser to the Comm sioner (to work closely with but outside of the new Division) w created and filled during the year and plans were formulated for r cruiting in fiscal 1963 a substantial number of economic developme specialists with training in the social sciences for the staffs of agenci area offices, and the Washington headquarters.

## *Feasibility Studies Launched*

The studies undertaken with ARA funds in the latter part of t fiscal year embrace a wide range of potential economic developmen to benefit Indians on reservations and Alaska natives.

Altogether 19 separate studies were initiated involving 15 reserv tions in 12 States as well as native villages of Alaska. Seven of t studies are focused on the possibilities of developing recreation facilities or tourist attractions as a source of employment and reven for Indians; two are aimed at providing better inventories of timb resources; two are concerned with the development of mineral ources; and others cover such diverse fields as the marketing of native rts and crafts produced in Alaska, the managerial skills of Indians n the Pyramid Lake Reservation in Nevada, and the feasibility of a ood processing plant on the Colorado River Reservation in Arizona.

## rogress Achieved on Other Fronts

Along with this overshadowing emphasis on economic development, any other activities of major importance took place during the year. he accelerated program of school construction, initiated in the spring f 1961 to eliminate unsafe and obsolete structures and provide suf- ient classroom space for all Indian children needing education in ederal facilities as soon as possible, moved encouragingly forward.

Tribal operations officers were established at all area offices and any of the agencies to help tribes improve their political and business ganizations along more up-to-date and efficiently functioning lines. broad range of activities was undertaken in the educational field improve English language capabilities of Indians pupils, to provide ore intensive instruction in the arts for young Indians with capabili- es and inclinations along this line, to upgrade further the quality of aching in all Bureau schools, and to deal with widespread problems ich as dropouts and lack of educational motivation. The scope of e Bureau's adult vocational training program was widened as a re- ilt of Congressional action increasing the appropriation authorization r the program from $3.5 to $7.5 million and appropriating an addi- onal $750,000 for use in fiscal 1962.

A fishery management specialist was added to the staff of the Bu- au's area office at Portland to help Oregon and Washington tribes ake more effective use of their commercial fish resources. In the nal month of the fiscal year a three-man task force appointed by the ecretary visited Bureau installations in Alaska and consulted with ople in the native villages on steps needed to improve Bureau erations in the far northern State.

# Economic Development

The prime significance of the Bureau's action in establishing a new ivision of Economic Development, headed by an Assistant Com- issioner, is that it brings more sharply into focus all those activities the Bureau that can contribute directly to the growth of a healthier d more dynamic economic climate on the reservations.

These include the programs of agricultural assistance (irrigation nstruction and maintenance, range management, and agricultural tension), the forestry work, activities connected with the leasing of Indian lands for mineral development or surface use, the constru tion and maintenance of roads linking up remote Indian localities wit major marketing centers or transportation arteries, the revolvir credit program to supply the financial lifeblood (over and beyond th available from ordinary sources) needed for tribal and individu Indian economic enterprises, and the industrial development progra to assist tribes in encouraging the establishment of private man facturing plants in localities where they will provide tribal membe with greater opportunities for year-round employment.

## *Comprehensive Planning Stressed*

Because the potentialities for economic growth vary greatly fro reservation to reservation—depending on the type and quantity physical resources, the availability of manpower and skills, proximit to markets, and many other factors—comprehensive planning for eac tribal jurisdiction is an essential first step in any orderly and ful effective program of economic advancement.

To give tribes greater technical help in this process, the Burea formulated plans during the year to strengthen the planning liaiso function at the agency level and to provide field specialists in vario aspects of economic development in the fiscal year 1963.

## *Area Redevelopment Assistance*

In fiscal 1962, considerable impetus was given to planning at th reservation level by the availability of loans and grants under th program of the Area Redevelopment Administration, Department Commerce. Indian reservations are specifically mentioned as p tentially eligible for assistance in the Area Redevelopment Act May 1, 1961 and the Bureau has maintained close liaison with AR since the beginning of its program.

During the past fiscal year, 51 reservation areas, encompassing reservations and 4 native areas in Alaska, were designated "Reserv tion Redevelopment Areas" under the eligibility standards in the Ar Redevelopment Act. Once this designation was made, the first ste in moving to secure ARA assistance was the formulation of a pr liminary overall economic development program (OEDP) for th designated area. With Bureau help, preliminary OEDP's were pr pared for 27 of the reservation areas and submitted to ARA. Twen of these were given provisional approval by ARA and the others we awaiting such approval at the close of the period. First steps we also taken on the preparation of comprehensive OEDP's which a required within one year after tentative approval of the prelimina documents.

*o lay a solid factual basis for economic development enterprises on Indian servations, 19 studies were launched in 1962 with funds supplied by the rea Redevelopment Administration. Seven of these were focused on the asibility of tourist attractions like the excellent trout streams which have een developed by the White Mountain Apache recreational enterprise in rizona.*

The 19 studies to determine the economic feasibility of various types economic developments were made possible by ARA technical sistance grants for contracts totaling $718,343. Altogether 51 quests for such grants were submitted to ARA by the Bureau; the her 32 were still under consideration at the end of the year.

## *avajo Irrigation Project Authorized*

An important milestone on the road to greater economic growth for e Navajo Tribe of Arizona, New Mexico, and Utah was reached on ne 13, 1962, when Presidential approval was given to a congressional t authorizing the Navajo Indian irrigation project. This culmi-ted 15 years or more of activity on behalf of the project by both the avajo Tribe and the Bureau of Indian Affairs.

Planned to provide irrigation for 110,630 acres of Navajo land in rthwest New Mexico, the project will furnish an economic agri-

*A major development of 1962 was the action of Congress in authorizing t 110,000-acre Navajo Indian irrigation project. The results that may expected are depicted in these two photographs taken on the smaller Hogba project which has been under way on the Navajo Reservation for seve years. The picture at top shows a Navajo family irrigating a Hogba project field. The bottom one depicts an excellent stand of alfalfa on anotl part of the project.*

ultural base for 1,120 Navajo families and will create employment pportunities for 2,240 more in service and commercial enterprises ade possible by the development. This means that as many as 7,000 individual Navajos, nearly one-fourth of the present reserva- on population, are in position to benefit directly after the project aches the stage of full operation. The water supply for the project ill come from the Navajo Reservoir on the San Juan River.

## *utdoor Recreation Possibilities Studied*

Stimulated by the outstanding success of the White Mountain pache recreational enterprise on the Fort Apache Reservation in rizona and other evidences of the economic potentialities of outdoor creation development, many tribes throughout the country have ken an active and growing interest in establishing tourist attractions their lands.

Under the ARA technical assistance grants, potentialities for creational development are being studied on the Crow Creek and ower Brule Reservations in South Dakota; the Warm Springs eservation in Oregon; the Red Lake, Grand Portage, Nett Lake, ech Lake, and White Earth Reservations in Minnesota; the Lac Flambeau, Lac Courte Oreilles, Bad River, and Red Cliff Reserva- ons in Wisconsin; the Pyramid Lake Reservation in Nevada; the opi Reservation in Arizona; the Nez Perce country in Idaho; the olorado River Reservation in Arizona; and the Mescalero and Acoma eservations in New Mexico.

On the Fort Berthold Reservation in North Dakota the tribal ganization obtained a permit from the Army Corps of Engineers vering the Four Bears recreational area on the manmade lake eated by Garrison Dam and is planning for commercial development rough a long-term lease.

On the Jicarilla Apache Reservation in New Mexico, Dulce Lake as opened to the public for the first time on July 1, 1961. It offers cellent fishing opportunities and facilities suitable for anglers.

## *ame Conservation and Management*

Fish and wildlife stocking programs are increasing the recreational tential on many reservations as well as providing a source of food r Indian people. The Bureau of Sport Fisheries and Wildlife ovides technical advice and, through cooperative agreements with e tribes, furnishes fish to stock tribal waters. Relationships tween the tribes and State game departments generally are im- oving and in many locations excellent cooperative relationships e enjoyed with better management and better hunting and fishing Indians and non-Indians the result.

*One hundred head of deer have been placed in the Tall Mountain area on t*
*Navajo Indian Reservation. Twenty-five additional deer are soon to*
*released which will complete this wildlife project.*

The problems associated with Indian treaty rights, particula
with respect to fishing in the Pacific Northwest, demand increas
attention. The extent of the Indian treaty right to fish without regu
tion at traditional locations away from the reservations has ne
been decided by the courts to the complete satisfaction of either t
Indians or the sports and commercial fishermen with whom th
compete for a share of this resource. In assigning a fishery mana
ment specialist to the Portland office, the Bureau of Indian Affa
hopes to assist the Indians in developing programs for increasing t
fish runs in the rivers which they control and in adopting conservati
practices which will be acceptable to them and their neighbors a
which, properly enforced, will help to lessen the tension betwe
members of these two groups.

## *Forest Inventories*

Up-to-date inventories of the volume of sawtimber have now be
completed on more than 80 percent of the 5.5 million acres of co
mercially valuable Indian forests. All of the inventories so
completed have shown a much greater volume than the data previou
available. As a result, it has been possible to increase the ann

mber harvest on many reservations without in any way sacrificing compromising the underlying principles of sustained-yield manage- ent.

Under the ARA technical assistance grants, timber inventories ere initiated on the Flathead, Blackfeet, and Rocky Boy's Reserva- ons in Montana and the Wind River Reservation in Wyoming. nother inventory, using BIA funds, was started during the year on e Mescalero Reservation in New Mexico.

## *imber Sales*

Partly as a result of the recently completed inventories, the amount timber cut from Indian lands in fiscal 1962 increased by 72 million ard feet as compared with the previous year and totaled 546 illion. The value of the total cut, however, decreased by about 00,000 to approximately $8 million and the average value per ousand board feet dropped $2.41 to $14.65. The decrease in average it value was due partly to the unfavorable market in the forest oducts industry but more significantly to the cutting of less valuable ecies, which took place on many reservations as the harvest ex- nded toward the allowable annual cut.

Table A shows the relationship of Indian timber production to the mber produced throughout the country during the past 10 calendar ars. Because these data are on a calendar year basis, they differ mewhat from those shown above. The table does not include data m the Klamath Reservation in Oregon and the Menominee Reser- tion in Wisconsin where trust and other responsibilities of the reau have been brought to an end.

TABLE A—*Sale of Indian timber and lumber production in the United States*

| Calendar year | Indian timber cut under contract | | | | Lumber produced in the United States | |
|---|---|---|---|---|---|---|
| | Thousand board feet | Percent of 1952 | Cash receipts | Percent of 1952 | Million board feet | Percent of 1952 |
| | 467, 641 | 100. 0 | 5, 941, 636 | 100. 0 | 37, 462 | 100. 0 |
| | 484, 986 | 103. 7 | 6, 809, 266 | 114. 6 | 36, 742 | 98. 1 |
| | 456, 185 | 97. 6 | 6, 788, 667 | 114. 3 | 36, 356 | 97. 0 |
| | 560, 479 | 119. 9 | 8, 181, 949 | 137. 7 | 37, 858 | 101. 1 |
| | 487, 445 | 104. 2 | 9, 269, 392 | 156. 0 | 38, 629 | 103. 1 |
| | 412, 292 | 88. 2 | 7, 942, 752 | 133. 7 | 32, 901 | 87. 8 |
| | 467, 376 | 99. 9 | 8, 540, 100 | 143. 7 | 33, 385 | 89. 1 |
| | 585, 239 | 125. 1 | 11, 614, 280 | 195. 5 | 37, 055 | 98. 9 |
| | 517, 742 | 110. 7 | 10, 287, 928 | 173. 1 | 34, 737 | 92. 7 |
| | 491, 940 | 105. 2 | 7, 599, 230 | 127. 9 | 31, 694 | 84. 6 |

## *Tribal Forest Products Enterprises*

The present mill on the Red Lake Reservation in Minnesota obsolete and not properly designed to turn out forest products from t large supply of lower valued species available. The tribe and t Bureau have decided to replace the sawmill with a high-speed ba mill which can economically handle the substantial volume of aspe other hardwoods and jackpine remaining in the forest. The new sa mill should be in operation by next year.

The present Navajo sawmill produces 15 million board feet annual but it, too, is becoming obsolete. The Navajo Tribal Council, wi the help of several consultants and the Bureau of Indian Affairs, h decided to construct another mill with an annual capacity of 38 milli board feet. Within a few years, production from the original m will be discontinued. The new mill will employ an estimated 3 men in the plant and the woods.

On the Fort Apache Reservation in Arizona a planing mill h operated for many years. A sawmill was also operated until in r cent years it was destroyed by fire. This function is now being a

*An impressive sign of economic progress on Indian reservations is the n tribal sawmill on the New Mexico portion of the Navajo Reservation. It an annual capacity of 38 million board feet.*

omplished through contract while the tribe continues to operate the laning mill. On the basis of an evident substantial increase of the llowable annual harvest of the tribal forest, and on the recommendation of an economic feasibility study, the tribe has begun to expand ne enterprise. Loans have been obtained from the Bureau of Indian ffairs for a new sawmill. Construction has begun and production hould begin in fiscal 1963.

In fiscal 1962 a logging enterprise was organized by the Blackfeet ndians. With Bureau cooperation, an agreement was executed between the tribal enterprise and the tribe for the purchase of reservation timber. The enterprise will harvest the timber and sell the logs to a private sawmill to be constructed.

## orest and Range Fires Increase

The 1961 fire season was severe throughout the West. Several rge fires burned on three of the Indian reservations in Montana and Vashington. During the season, the Bureau of Indian Affairs suppressed 1,629 fires, which burned 15,379 acres of timberland and )8,679 acres of range and other classes of lands. The total area urned was one-quarter of 1 percent of the Indian lands requiring rotection. Over $1 million was required to suppress these fires.

## eal Estate Appraisal Work Given New Emphasis

One of the important moves involved in the reorganization of the ureau for economic development was the creation of a new Branch Real Estate Appraisals in the Division of Economic Development. ppraisal work was previously handled along with transactions activy by the former Branch of Realty. The decision to set it apart and ek funds for a larger staff of professional appraisers in the field was otivated by a realization that the rapidly changing patterns of land se over much of the West are increasingly affecting and impinging on dian land holdings. In many cases it is known that Indian lands e bringing to tribal and individual owners much less than their full come-producing potential and in some localities profitable opportuties for development are being wholly overlooked. More extensive ofessional appraisal work should help greatly to correct these ficiencies.

One of the important functions of the new Branch is to prepare praisal reports on lands being offered for lease or involved in other pes of transactions. In fiscal 1962, such reports were prepared for out 9,000 individual land transactions and were needed for a total 45,000.

A second major function of the Branch is the preparation of real tate planning reports which point out the highest and best use that

can be made of Indian real properties. About 20 such reports w
completed during the year covering whole reservations or segme
thereof. Expansion of this activity in the future should bring ab
important increases in the overall income from Indian lands and p
vide a more solid foundation for balanced programs of economic
velopment on the reservations.

## *Mineral Development Activity*

Two coal prospecting permits with option to lease were approv
during the year on the Navajo Reservation in New Mexico. C
covers in excess of 75,000 acres with option to lease as much as 25,0
acres. The other covers nearly 50,000 acres with option to le
areas containing 150,000,000 tons of coal reserves. Another simi
permit was approved on the Hopi Reservation, Ariz., coveri
approximately 36,500 acres.

A 3-year mineral prospecting permit was approved on the Papa
Reservation, Ariz. The permit grants an option to as many
25 mining leases and covers all minerals except oil and gas. T
permit covers approximately 4,335 square miles; all of the Papa
Reservation except about 47,000 acres of tribal land that was adv
tised for competitive bidding at about the same time.

Leasing of Indian lands for oil and gas development brought in
total income of $38,161,000 in bonuses, rents, and royalties.
additional income of $3,171,000 was realized from leasing for oth
types of mineral development. The grand total from mineral leas
and surface leasing for agricultural, business, residential, recreation
and other improvement purposes was approximately $51.5 millio

The first sale of oil and gas leases on the lands of the Zuni Reserv
tion in New Mexico was held during the year and brought in bon
offerings totaling over $24,000.

## *Volume of Realty Transactions Grows*

One significant measure of expanding economic activity on Indi
reservations was the sharp increase in the number of requests
applications for transactions involving Indian land received by t
Bureau during the year. Altogether, 76,040 requests for transactio
of all types were received as compared with 65,255 in fiscal 19
Trends in the economics of land use in the United States, and pa
ticularly on Indian reservations, suggest that the volume of tra
action requests will continue increasing in future years.

A new title plant was established in the area office at Portlar
Oreg., making this the fourth area provided with such faciliti
Plans were formulated for setting up similar plants in the area offic
at Phoenix, Ariz., and Anadarko, Okla., early in fiscal 1963.

During the year, a pilot project of consolidating fractional ownerhips of tracts in "heirship" status into single ownerships of conomically useful size through an extensive program of exchanges was initiated on the Pine Ridge Reservation in South Dakota. If he procedure proves effective and useful, it will have wide appliability on other reservations.

Under a congressional act of September 14, 1961, nearly 70,000 cres of public-domain lands were transferred to eight of the New Mexico Indian pueblos. The transferred lands were intermingled with other pueblo holdings and have presented troublesome management problems for many years.

## Credit—A Necessary Tool

Adequate financing is a prerequisite of any program for economic development of Indians. While total financing has increased from about $43 million to $108 million during the past 10 years, available funds continue to lag behind need.

Of recent years, banks and other lending institutions serving citizens generally have become increasingly conscious that Indian well-being is vital to the well-being of the total area; that Indian resources, both human and physical, are underdeveloped and underutilized; that Indians are entitled to the same assistance as other citizens; and that they present an opportunity for increased business and profit. Over the past 10 years, the amount of financing furnished Indians from such sources has increased from an estimated $20 million to over $75 million.

One factor which has undoubtedly helped to account for this increase has been action by certain tribal groups such as the Shoshone of Wyoming and the Mescalero Apaches of New Mexico in entering into guaranty agreements covering bank loans made to tribal members who qualify in every way except for adequate security. Along the same line, the Blackfeet Tribe of Montana has posted a $50,000 guaranty fund which enables a local production credit association to make loans to tribal members who could not qualify under its customary procedures. The association had nearly $110,000 outstanding in loans under this agreement at the end of the fiscal year.

## Federal Revolving Fund and Tribal Financing

Two main funds are used in financing Indians through the Bureau. If a tribe has available money of its own, it is required to use its funds before a loan by the United States is approved. A total of $22.3 million of tribal funds was being used at the close of the fiscal year

The second source is a revolving fund for loans authorized by th Congress. At the close of the fiscal year, loans from the fund totalin about $10.4 million were outstanding.

During the year, the authorization for the revolving fund wa increased by the Congress from $17 to $27 million. An additiona $4 million was appropriated, bringing the total to $17,799,600.

Due to its revolving nature, loans totaling over $38 million hav been made from the Federal revolving fund, of which $27.5 millio has been repaid and $187 thousand cancelled.

Commitments for additional loans totaling $6.4 million were mad during 1961 compared with $3.2 million in 1960. Applications tota ing nearly $12 million had either been approved or authorized subjec to the availability of funds at the close of the fiscal year. Thes applications are mainly for relending operations; however, nearl one-half of the amount is for tribal enterprises and loans to attrac industries to operate on or near reservations. Requests in variou stages were pending for almost an additional $40 million.

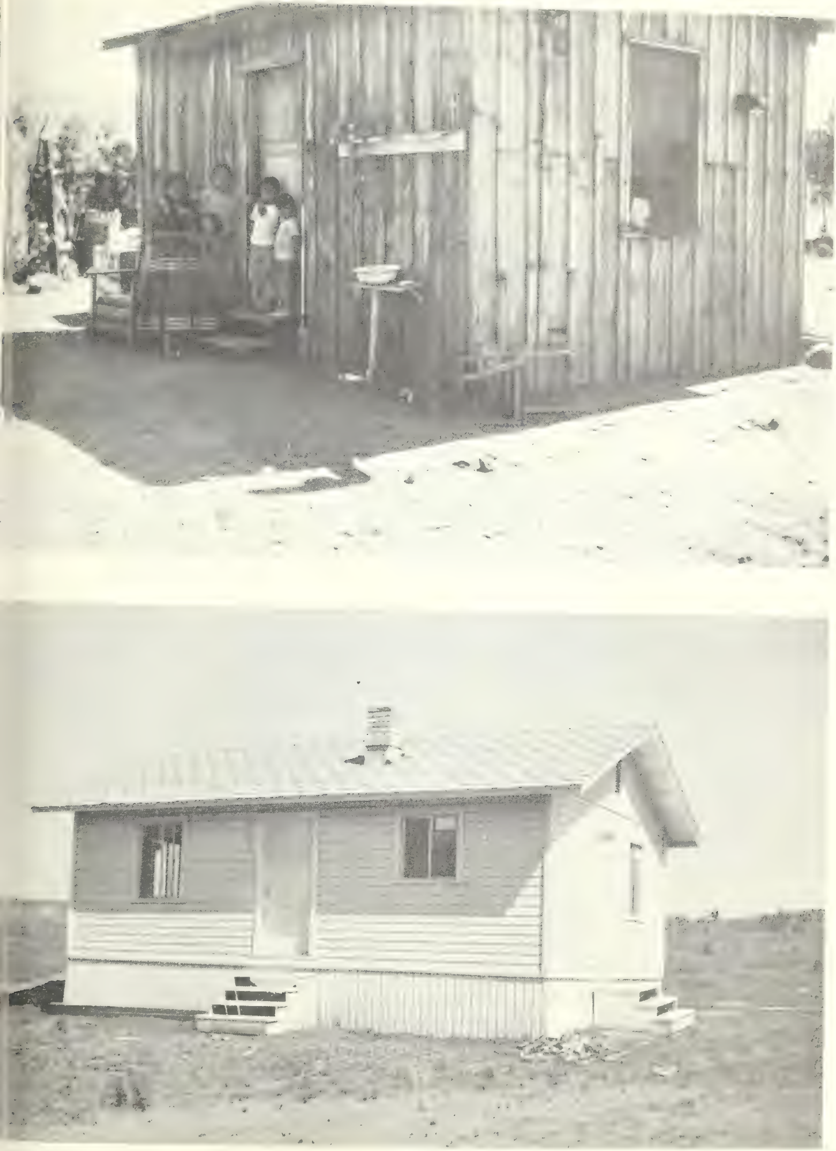
### *Better Housing Planned for Indians*

Provision of adequate housing has been recognized universally as basic essential to effectuating improvement in social outlook and ec nomic betterment of a group of people. Bureau efforts to accelerat improvements in the notoriously substandard housing of Indians hav been directed toward opening up Indian reservations to the financi assistance already available through Federal housing agencies to no reservation areas. Progress along this line has involved accommoda tion on the part of all agencies and institutions concerned to the syste of land tenure which is characteristic of Indian landholdings.

A comprehensive memorandum of understanding was executed i fiscal 1962 between the Bureau and the Federal Housing Administra tion which will provide mortgage insurance on leasehold estates o Indian trust lands. Negotiations were also intiated with the Feder National Mortgage Association for the establishment of a special fun for the purchase of insured mortgages on leasehold estates on India trust lands.

In the public housing field significant advances were made followin a determination by the Public Housing Administration that trib groups can participate in the benefits of its low-rent housing progra if they are recognized as governmental entities and projects are locate on tribal lands.

In line with this determination a number of tribes adopted ord nances establishing local housing authorities. On the Pine Rid Reservation in South Dakota a contributions contract was execute between PHA and the Oglala Sioux Housing Authority in the amou



*the Fort Apache Reservation in Arizona eight families joined forces ring 1962 in a "self-help" housing venture which is being closely studied the Bureau of Indian Affairs as a key to wider action on other reservations. he picture at the top shows the type of housing being replaced, while the oto at the bottom depicts one of the homes constructed under the venture. nancing was provided from the tribal loan fund and the labor was furnished the families working together. Technical guidance was supplied by a rpenter on the tribal payroll.*

of $1,120,232. It provides for the construction of 88 low-rent uni including 23 for housing elderly members of the tribe. The Standir Rock Sioux Housing Authority has entered into a similar contract i the amount of $1,664,082 for the construction of 100 similar units.

Both of these developments are located near established industri and will afford better living standards for Indian families employe in the plants. Many of the other tribes are planning to locate the housing projects close to potential industrial sites.

In the latter part of the year the White Mountain Apache Tribe Arizona started a pilot self-help housing project with eight trib families participating in the program. Tribal loans were made these families for the purchase of materials. A cooperating agreeme was executed by the participants who did all the construction with tl assistance of a construction supervisor furnished by the tribe.

The Bureau is exploring the possibility of systematically encoura ing and assisting similar self-help housing programs on other reserv tions throughout the country.

## *Industrial Payroll Gains*

During the year, three industrial plants were completed and o expanded in reservation areas. When in full operation, they w provide approximately 860 jobs. To date, 20 industrial plants ha been established on or near Indian reservations as a result of t coordinated efforts of Indian tribes, local communities, other Gover ment agencies, and representatives of the Bureau. When in fu operation, it is anticipated that the plants will provide about 3,2 jobs, approximately 70 percent of which will be filled by Indi workers.

At Chandler, Ariz., Harry Winston, Inc., internationally famo diamond merchants of New York City, started operating in May 19 their new plant which has 40 Indian employees and plans to take 30 new Indian trainees per month until a work force of approximate 200 is reached.

The Shelton Basket Corp., a cooperative venture of the Lac Cour Oreilles Band of Lake Superior Chippewas and the community Hayward, Wis., expanded its operations by establishing an ammun tion box division in the spring of 1962 in order to carry out a supp contract with the Department of Defense. This was believed to the first contract ever awarded by a Government agency to a corpor tion controlled by American Indians. Including the new divisio the company employs 108 workers, 77 of whom are Indians.

Another example of cooperative industrial development activi was in eastern Oklahoma where the Seminole Tribe and the communi of Wewoka got together not only in financing a locally owned compa

*urther progress was made during 1962 in the development of private in- ustries that furnish year-round employment for Indian people on reservations. fishing tackle plant on the Pine Ridge Reservation in South Dakota, when i full operation, has a payroll of 380 workers.*

*Another major industrial development was the establishment of a diamon*
*processing plant at Chandler, Ariz., which began operations in May 196*
*It furnishes jobs to many Indians from nearby reservations and will eventual*
*have a payroll of about 200 workers.*

but in its management through joint representation on the board
directors. The company is known as Plasteck Central, Inc., and w
formed by the citizens of Wewoka for the primary purpose of purcha
ing a plastics manufacturing firm and establishing the operations
Wewoka. The plant produces aircraft cockpit illuminating contr
panels for military and defense contractors, and will make panels f
automobiles, computers, and other uses. Production started in N
vember 1961, and the plant is now employing 20 workers, 10 of who
are Indians.

A result of the cooperative liaison activities of representatives f
the Small Business Administration, the Ashland Industrial Develo
ment Corp., Wisconsin, and the Bureau of Indian Affairs is the loc
tion of the Swiss Precision Manufacturing Division plant in Ashla
by the Rainier Co., Inc., of New York City, to make precision gea
and related items. Operations started in June 1962 with appro
mately 30 workers, 13 of whom are Indians. The company anticipat
that they will employ between 150 and 200 workers when in full oper

on. The Bad River and Red Cliff Bands of Chippewas will benefit, rimarily, from opportunities for Indian employment opened at this ant.

## raining in Conservation and Farming

Youth conservation camps are becoming very popular on Indian servations. The camps first started because tribal officials found need for healthful recreation and education in the conservation and velopment of natural resources to occupy the youth during the sumer months. The youngsters get instruction and demonstrations in the nservation and development of natural resources and are instructed health, recreation, safety, and other activities. Technicians of the ureau of Indian Affairs work with the tribes in these camps and rnish instruction.

In fiscal 1962, personnel from the Bureau's Branch of Land Operaons, county agents, and land-grant college extension service specialts participated in more than 10,000 meetings held in carrying out tension work with Indians. In addition to group meetings, emphas was placed on working with individual Indian families through rm and home calls by extension agents to stimulate interest in mmunity activities, improved livestock and crop production, and me management practices.

During the year there were approximately 10,000 Indian boys and rls throughout the country participating in 4-H Club activities. any received county and statewide recognition for their achievements project completions and in giving demonstrations.

## ange Management

Indian tribal leaders as well as Indian ranchers and landowners roughout the country are showing increased interest in their range nd, its use and management. Bureau emphasis on reservation onomic development planning and range or ranch unit planning and velopment, coupled with a growing awareness of the economic facts livestock production, brought this about. Basic to range use planng is an inventory of the physical resource. The inventory of Indian ngeland, initiated by the Bureau in 1957, has been progressing at the te of approximately 3.75 million acres a year. Work has now been mpleted on about half of the 42 million acres to be surveyed.

Indian use of the range resource is increasing and 86 percent of it currently being used by Indian operators. The livestock industry of major importance to Indian people and every effort is made to omote better livestock and range management to increase the ecomic return to the operators. One result of these efforts is exemplified by the Papago tribal herd range in Arizona. The Papagos hav adopted a supplementary feeding program resulting in a marke increase in the calf crop and weight of livestock sold. It also enabl better use to be made of the range resource.

*The range conservationist and Indian livestock operators cooperatively pla for proper range use on the Blackfeet Reservation in Montana.*

## *Improvement of Roads Continues*

One factor which has operated for many years to retard full ec nomic and social development on Indian reservations has been the lac of adequate road facilities.

The Bureau's program of road construction and maintenance, whic began in 1933, produced many helpful improvements over the year but was so late in getting started and so meagerly financed for a lon time that it fell far short of meeting the needs. In recent years, how ever, appropriations for this work have been much more generous an striking progress has been achieved in many areas.

In fiscal 1962 nearly 400 miles of Bureau roads were black-toppe and the cumulative effects of work done in earlier years becam increasingly apparent. These effects were noticeable in the large number of Indians driving late model pickups or shopping in super markets and in the growing number of industrial concerns which wer finding it possible to operate in previously isolated reservation area hese tangible evidences of progress in fiscal 1962 held promise for etter school attendance and other manifestations of economic and cial advancement on reservations in the years ahead.

# *Education*

To a greater extent than many people realize, the Bureau of Indian ffairs is today, and has been for many years, basically, an education gency. Funds spent for the operation of its extensive school system th on and off reservations together with construction appropriations ed for building or rehabilitating various types of school-connected cilities account, in total, for more than 60 percent of the Bureau's dget. Involvement of Bureau personnel is in a similar ratio. And en some of the Bureau's more technical programs, such as forestry d agricultural assistance, are largely educational in nature.

The fiscal year 1962 was an unusually active one in Indian education d brought significant advances on many fronts.

### *ncouraging Progress in School Construction*

Despite the impressively large amount of Indian school construction complished over the 8-year period beginning in 1953, there were ill nearly 9,000 Indian children from 6 through 18 years of age out of hool in the spring of 1961 and almost 5,000 of these were not enrolled cause of a lack of classroom space. This problem of insufficient ace was centered chiefly on the Navajo Reservation in Arizona, ew Mexico, and Utah; in the native communities of Alaska; and on e Choctaw Reservation in Mississippi.

In addition, many of the Bureau's schools were badly overcrowded; any, built shortly before or after the turn of the present century, ere seriously obsolete; many had structural or other deficiencies that ade them unsafe or insanitary for further continued use.

Through an accelerated program of school construction, launched the spring of 1961, the Bureau aims to accomplish three prime jectives over a period of approximately 4 fiscal years: (1) Elimina- on of the most serious overcrowding in Federal Indian school cilities; (2) correction or elimination of the deficiencies that represent ealth or safety hazards; and (3) construction of enough additional assrooms and related facilities to accommodate all Indian children eeding education under Bureau auspices. Since the number of dian children in the school-age bracket grows larger every year, e total capacity of the system will obviously have to be increased considerably more than 5,000 seats in order to achieve the third of ese objectives.

In fiscal 1962 the Bureau completed 18 school construction projects adding 675 classroom seats to the capacity of its system, and initiate 40 more projects which will eventually accommodate an additiona 2,786 Indian students. It was an encouraging record for the first fu fiscal year under the accelerated program.

*Under an accelerated program of school construction the Bureau of India Affairs in 1962 completed 18 projects providing classroom space for 67 additional pupils and initiated 40 projects that will eventually make roo for 2,786 Indian students. The classroom building shown above is part of th project completed at the Teec Nos Pos School on the Navajo Reservation.*

Among the more important of the completed projects were on adding 249 seats at the Teec Nos Pos School on the Navajo Reservation in Arizona, another adding 120 seats at the Dunseith School o the Turtle Mountain Reservation in North Dakota, and a thir contributing 102 additional seats at the Busby School on th Northern Cheyenne Reservation in Montana.

Outstanding projects initiated but not completed during the yea included construction of a wholly new facility with 630 classroo seats on the Navajo Reservation at Tuba City, Ariz., and expansio of existing facilities at 7 other locations on the Navajo Reservation These latter projects will add 212 seats at the Shonto School, 188 a the Dilcon School, 147 at the Dennehotso School, and 118 at th Hunter's Point School, all on the Arizona portion of the reservation and 150 seats at the Crownpoint School, 150 at the Pueblo Pintad School, and 136 at the Tohatchi School in the New Mexico reservatio area.

## *chool Construction Standards Improved*

During the year education and construction personnel of the Bureau intly evaluated standards for school construction in the light of anging educational needs. The standards formerly in use designed incipally for elementary children, were revised and new standards ere established for the construction of facilities for high school udents and dormitories for older children. These new standards ll provide more adequate facilities for urgently needed libraries d laboratory classes in science courses; and the dormitories will of emselves increase learning opportunities for Indian children who me mainly from economically disadvantaged homes. The approved andards represent a very important step toward education of better ality for Indian children.

*r many years the Bureau of Indian Affairs has stressed English language aching in its schools. Today it is conducting research in modern "language boratory" techniques to speed up the process.*

## *nglish Language Teaching Highlighted*

Emphasis on the teaching of English as a second language continued roughout Bureau schools during fiscal 1962. Several articles were published in Indian Education, a semimonthly publication addresse to all Bureau education personnel, to clarify (1) the present status this subject in Bureau schools, (2) the fundamental principles unde lying the teaching of language, (3) goals that must be achieved learning English as a second language is effective, and (4) techniqu indicated if the goals and principles are to be realized.

The Intermountain School at Brigham, Utah, began a resear project on the use of the language laboratory to assist Indian pupils speaking correct English. This laboratory and the series of film "Let's Learn English," developed by the U.S. Information Agenc were introduced to education supervisory personnel at a Bureau-wi workshop. Plans were made for additional research on the best us that Bureau schools can make of the laboratory and films to impro the learning of English as a second language.

Experiments were carried on in the Albuquerque and Shipro schools in adapting special techniques of teaching English as a seco language. The Navajo Agency orientation workshop carried successful projects which assisted new teachers to understand quick the problems of non-English speaking pupils who are beginning functional situations to learn English as a second language.

## *Summer Activities Grow in Importance*

The summer programs which the Bureau initiated on a trial bas for students in its schools during the vacation months of 1960 we continued and expanded in 1961. Total enrollment rose from 2,2 to 7,246.

The four main categories of these programs were recreation, ac demic instruction, student employment, and field trips. The ma features of the recreation program were sports and games. The ac demic programs emphasized remedial work in the skill subjects wit special attention given to oral and written English. Pupils who ha special learning problems during the regular term were given opportunity to catch up during the summer months. The progra of summer employment for students answered one of the most impo tant needs of teenagers—the opportunity to earn money through the own efforts. The field trips provided under the summer program we designed to broaden the Indian child's horizon by giving him ma and varied experiences beyond the restricted scope of his life on t reservation. Indian youngsters were given the opportunity to lea their reservation areas, some for the first time, and participate activities that are taken for granted by non-Indian youngsters.

An evaluation of the 1961 program revealed a number of benefit Juvenile delinquency was substantially reduced in locations whe summer programs were in operation. Academic gains were ma uring the summer months. Students were given opportunities to ake money, and the background of a number of students was en-ched through field trips. One of the most important results of the rogram is that a large percentage of the participants returned to hool.

## Institute of American Indian Arts

In August 1961, the Bureau announced plans for converting the anta Fe Indian School into the Institute of American Indian Arts. The institute will enroll Indian students from all federally recognized ibes throughout the country and is planned as an accredited senior gh school with instruction in the usual academic subjects. In addi-on, the curriculum will cover broad as well as specialized training the creative arts, and will prepare the student for vocational pportunities in applied arts and related work.

During fiscal 1962, contracts were let for the construction and con-rsion of buildings to be completed before the institute opens. The ganization and staffing of the school have progressed to the point here a definite date of October 1, 1962, has been set for the opening.

## Concho Demonstration School

Two dormitories at the Concho School in Oklahoma have been con-rted to the Concho Demonstration School. These dormitories will ovide living accommodations, classrooms, and recreation facilities r the educational rehabilitation of approximately 48 students who ave dropped out of school or have demonstrated low educational otivation. The school will serve as a demonstration laboratory for -service training of guidance and teaching personnel who need help developing skills and programs in working more effectively with udents who are potential dropouts or in need of educational moti-ation. Students will be accepted for enrollment in September 1962.

## The Master Teacher Program

Special attention was given to a program for reemphasizing high-uality teaching and for recognizing the superior teacher through omotion to a GS–9 position. Guidelines and criteria for develop-g superior teaching, set up previously by representative committees education personnel from all areas, were distributed for the reac-on and assistance of teachers, supervisors, education specialists, and lministrators in all areas. Meetings for this purpose were attended y a very large percent of all Bureau teaching personnel. Content r the 1962 Bureau-wide education workshop originated in these eetings.

This workshop, held in June, dealt with the improvement of supe visory skills of all personnel in the education program. The 200 pa ticipants contributed materially to its success, and furthered the po sibility of putting into effect in the near future the master teach program and the upgrading of teaching and supervision througho the school staff.

## *Story of Special Navajo Program Published To A Educators*

An account of the origin, development, and accomplishments the special program in the education of teenage illiterates of t Navajo Tribe was published during 1962. The purposes to be serv by the written account are (1) to make a record of this educati program which has served several thousand young Indian people f the past 15 years; and (2) to share with interested educators, a with communities everywhere, the experiences of Bureau educati personnel in dealing with a serious and urgent problem of undered cation of teenagers and young adults.

It is expected that this story will have meaning for people in wide scattered parts of the world because it contains principles and guid lines that are central to any sound education program, particular one that is attempting to meet the needs of an eager but educational handicapped group of young people.

## *Indian Participation in Education Programs*

Interest and support of the education program by Indian paren and tribal officials continued to increase. A survey made in the sprin of 1962 revealed wide participation by Indians in school manageme and planning groups such as parent-teacher associations, school board and school committees. The survey showed that there are at lea 414 PTA groups in which Indian members participate. In additio 284 school boards have a total of 367 Indian members. There a 12 Indian members of Indian commissions and a total of 1,214 India members of booster and other community organizations. There evidence that such participation is greater than indicated by the su vey since responses were not received from every school group.

The Fifth Annual Conference on Navajo Education, planned an directed by the Navajo Tribal Education Committee, brought to gether large numbers of Bureau education officials, public school an mission school officials, and Navajo tribal officials. The conferen dealt with the status of education of Navajo children and youth, an with the direction which education should take in the next sever years.

Following the meeting a planning conference was held involving dministrators and specialists concerned with schools enrolling older avajo students. At this time goals for the education programs were examined and redefined, and plans were made to begin study and vision of the curriculum guides used in these schools.

## Work with Colleges

A 3-week workshop, "Trends in Indian Education," was conducted 1962 for the benefit of public school teachers who teach considerable umbers of Indian children. This workshop, held under the auspices the Eastern Montana College of Education, took place on the college campus. Serving as workshop resource persons were personnel om the Bureau's education staff, the Director of Indian Education om the Montana State Education Department, a Crow Tribal Coun- member and local school board members, and a public school incipal. Twenty-six public school teachers completed the workshop urse, earning from 3 to 5 hours of college credit. Excerpts from eir writings in the course were used in *Indian Education* articles.

*any Indian adults seek an education and want to learn so that they may ke their place in the mainstream of American life. This class, at Twin kes, N. Mex., on the Navajo Reservation, was typical of those conducted the Bureau of Indian Affairs in communities during 1962.*

## *Adult Education*

Many Indian people are at a disadvantage in their communities b not having attained sufficient language, social or economic skills permit them to be self-sufficient in modern living. For the benefit educationally disadvantaged adult Indians who can qualify for suc services, the Bureau conducts special education programs where th need and desire are indicated.

Adult education teaching units have been established upon the r quest and with the concurrence of the tribal governing bodies at agencies and locations throughout the United States. These teachin units are now serving approximately 127 Indian communities, an offer a wide variety of instruction. Over the past 6 or 7 years approx mately 6,700 adult Indians have been participants in formal and i formal learning activities under this program. Of this number, completed the required courses for equivalent high school graduatio

## *Higher Education*

The Bureau continued its work of encouraging and promoting th enrollment of qualified Indian students in courses of higher educatio This is effected through the guidance programs in Bureau school through close cooperation with public and mission schools, and throug coordinating Federal grant, loan, and working scholarship program with scholarship aid programs of State and tribal group organizatio and with other non-Federal organizations and institutions.

Over 4,500 Indian students were enrolled in schools above the hig school level in 1962; approximately 2,900 of these were enrolled i college courses leading to a degree.

## *Enrollment Continues to Rise*

Enrollment of Indian children of school age increased 4 percent i fiscal 1962 as compared to the preceding year. Of the 117,562 en rolled, 59.2 percent attended public schools, 33.1 percent were i Federal schools, and 7.7 percent were in mission and other privat schools.

The Bureau of Indian Affairs in fiscal 1962 operated 263 schools wit an enrollment of 42,045 including those under 6 and over 18 years o age. In addition, dormitory facilities were provided at 20 locations fo students who attended public schools. Dormitory operations of th type are used to meet unusual emergency needs and do not reflect permanent pattern for educating Indians.

The long-range objective of the Indian education program calls fo the eventual enrollment of all Indian children in public schools. I a number of States this objective has been reached. In other State

ving large Indian populations the number going into the public
hools increases annually. During 1962 public school enrollment in-
eased by 4,664 students. Since the fiscal year 1960, Bureau reports
ve not included the number of Indian children enrolled in public
hools in California, Idaho, Michigan, Minnesota, Nebraska, Oregon,
exas, Washington, and Wisconsin, where responsibility for their
ucation has been accepted by the States, and Federal schools for
ate residents are no longer operated.

## *Tribal Operations*

In the vital field of tribal planning to promote the general welfare of
bal members, significant advances were made during the year by
e leadership of the Nez Perce Tribe of Idaho, the Omaha Tribe of
ebraska, and the Standing Rock Sioux Tribe of North and South
akota.

An act of April 24, 1961 (75 Stat. 45), provided that the $7,157,-
5.06 awarded the Nez Perce by the Indian Claims Commission could
used as the tribe's governing body saw fit after approval by the
cretary of the Interior. Last September, the Secretary approved a
ogram for use of the judgment funds providing for a per capita pay-
ent of $750 to each of the 2,064 tribal members with the remainder
approximately $4,024,195 to be programed for reservation develop-
ent. Currently, a committee composed of leading business and pro-
ssional men in the area, as well as tribal leaders, is working closely
th Bureau representatives to determine the best plan for providing
sting benefits for all tribal members.

The Omaha Tribe of Nebraska has formulated an energetic develop-
ent program. It was approved by the Secretary of the Interior
d details for each phase of the program were being worked out by
bal leaders at the end of the reporting period. Bureau members are
sisting the tribe in furthering its aims and encouraging modification
organizational documents to permit the tribe to better avail itself
facilities offered by other Government agencies. The program
cludes plans for land purchase and a tribal scholarship grant pro-
am, development loans to individuals, and a plan for the formulation
the tribe's overall economic development. The act of September 14,
61 (75 Stat. 508), authorized the Secretary to prepare a membership
ll to serve as a basis for the distribution of the $2,900,000 judgment
arded the tribe. A per capita payment of $750 has been approved
d approximately $1,200,000 of the award is currently earmarked
the development program. About 2,500 Indians will be involved

The Standing Rock Sioux Tribe of North and South Dakota is als realizing continuing gains from its $9 million rehabilitation progra made possible by settlements under the act of September 2, 195 (72 Stat. 1762). The major portion of the family plan phase of th program (described in some detail in the 1960 annual report) has bee completed. In fiscal 1962 the tribe completed construction of tribally operated bowling alley and a greatly needed administratio building.

## *Bureau Helps Tribes to Improve Organizations*

Essential for tribal development is improving tribal organizatio In fiscal 1962 the Bureau broadened and intensified its activities provide tribes with technical aid in bringing about such improvement

An outstanding development was the organization of the Miccos kee Tribe of Florida under the Indian Reorganization Act of June 1 1934 (48 Stat. 984). At an election held December 17, 1961, th proposed constitution and bylaws of the Miccosukee were adopte and the Secretary of the Interior approved the document on Ja uary 11, 1962. A major barrier to improving the lot of the 1 individuals on the Miccosukee roll was thus removed.

The updating of constitutions by amendment to permit mo effective tribal operation continued. The Devils Lake Sioux North Dakota began functioning under a revised constitution an bylaws and in June approval was given to amendments of the co stitution and bylaws of the Rosebud Sioux Tribe of South Dakot The changes at Rosebud will permit the tribe to take greater advanta of services of other Government agencies. The Florida Seminol changed in its entirety the article of their constitution dealing wit enrollment.

The Bureau, to provide tribes with greater assistance in achievi more effective government, appointed during the year for the fir time area tribal operations officers who will devote their time working with tribal groups within their area on all questions of trib operation.

A special task force visited many of the native villages throughou Alaska during June and gathered material to add to the Task For Report on Indian Affairs made to the Secretary on July 10, 196 covering Indian areas in other parts of the United States. Associat Commissioner James E. Officer represented the Bureau of India Affairs. Prior to the task force visit, the Bureau assigned a trib operations officer to the Juneau area office to help the native com munities develop appropriate organizations for the management their economic affairs.

## ctivities Under Termination Laws

Although Department of the Interior responsibility for several ibes was officially terminated during the reported year under the ovisions of laws enacted in the 1950's, the Bureau continued a endly interest in the success of these tribes and their members in eir new era of self-government and self-management as citizens of eir respective States.

Revocation of the Federal constitution and bylaws of the Catawba ibe of South Carolina on July 1, 1962, by the Secretary (under thority of the act of September 21, 1959) marked the end of the ationship that existed between the tribe and the Government. efore this termination action the Bureau made a final roll of the tawbas and each of the 631 members received his or her share of the bal assets valued at $186,774.40. Some 369 members took their are in land (1,800 acres), and 262 members chose instead money tained from the sale of unselected land (1,400 acres). The State South Carolina still holds in trust for the Catawbas a 640-acre act known as the Old Reservation.

Termination notices were published during the reporting year for f the 41 California rancherias named in the act of August 18, 1958 2 Stat. 619), after the assets on each rancheria were given to the dians in accordance with a previously approved distribution plan. ven rancherias had previously been terminated. The provisions the plans of 24 more rancherias are being worked out as a major oject in California. The title insurance companies in that State questioning the insurability of titles given to the Indians under act, and the issuance of deeds by the area director has been halted til this question is resolved. The Public Health Service is canvass- the rancherias under termination to ascertain on which rancherias an install water and/or sewerage facilities under Public Law 86–121 fore termination takes place.

Federal supervision over the affairs of the Klamath Indians of egon came to an end August 13, 1961. The Klamath Termination t of August 13, 1954 (68 Stat. 718), permitted members who so de- ed to withdraw their share of tribal property in cash and to carry on independent citizens. Tribesmen could also choose to maintain mmon ownership of their shares of tribal property under State stead of Federal law. Withdrawal was favored by 1,660, or 77 rcent of the enrolled members. A total of 473 chose to remain as group and received about 145,000 acres which is managed for their nefit by a Portland bank. A sum of $43,241.90 was paid to each those withdrawing, for the majority of whom, being minors, lividual trust funds were established.

Federal supervision over 490 "mixed-blood" members of the Ute ibe of the Uintah and Ouray Reservation in Utah ended August

27, 1961, pursuant to the act of August 27, 1954 (68 Stat. 877), a amended. The "mixed-bloods" have organized themselves as th Affiliated Ute Citizens of the State of Utah and have establishe three corporations to administer land, claims, and other propert held among them in common. Those owning individual allotmen of trust land were given patents in fee.

### *Unresolved Problems*

Also during the reporting year, the Bureau sponsored legislation t effect the termination of Federal responsibility over the Indians the Ponca Tribe of Nebraska. This legislation was introduced at th request of some of the tribal members and, if enacted, will not tak effect until it is approved by a majority vote of the tribal membershi

Despite the gains made in the area of tribal operations, many issu continue to confront the Bureau. Finding even partial solutions wi prove difficult. A way must be found to end the dispute among th leaders of the Kiowa, Comanche, and Apache Tribes in Oklahom which has virtually removed the possibility of effective tribal goverı ment. The Crows of Montana are faced with the problem of revisin their constitution to provide for more stable government to enab the programing of a $10,242,984 judgment awarded them in Ma 1961. The Pine Ridge Sioux also are confronted with the need t update their constitution. The ramifications stemming from th submission of a two-step termination plan by the Colville Tribes Washington State will cause several thorny problems.

Many complications are expected to develop in ascertaining th beneficiaries of a large number of claims awards made, or about to b made, to small Indian tribes throughout the Pacific Northwest, som of which are unorganized and whose members are widely disperse Similar problems are likely to arise in connection with distributin the Cherokee claims award of more than $14 million. During th fiscal year, legislation was introduced to divide this money among th individuals listed on the final Cherokee roll of 1907 and heirs deceased enrollees. In the case of many tribes, the claims awar have provided the first large sums of money ever available for grou and invididual development and helping some of them with organizin in such a way as to make the best use of these sums is certain occupy a major share of the time of the Bureau's tribal operatio staff in the months and years ahead.

## *Employment Assistance*

The name of the program formerly known as Relocation Servic was formally changed in fiscal 1962 to "Employment Assistance

he new title was considered more descriptive of the many facets of
dividualized economic and social service provided under the program.
Over the years the Bureau has consistently broadened the scope
this program and refined its coverage in line with the practical
mands of attempting to best serve the Indian. During fiscal 1962,
addition to the regular program of service for direct employment,
cational training of adults in selected and approved institutions,
d on-the-job training in industrial plants in both within State and
t-of-State (metropolitan urban) situations, several types of special
mployment assistance" services were provided to interested and
gible applicants.

## ecial Aid for Catawba Indians

On the Catawba Reservation in South Carolina, where Bureau
rvices were scheduled to end July 1, 1962, a census of needs was
ade during the fiscal year and funds were obligated to provide

***addition to the vocational trainees, many Indians moved to urban com-***
***unities with Bureau help in 1962 for direct employment. This home in***
***n Jose, Calif., is owned by an Indian from Concho, Okla., who relocated in***
***57 and now earns $11,000 a year as a tool checker in a nearby industrial***
***ant.***

special vocational training for 39 adult members of the tribe. Thes funds were used for developing vocational skills at approved trainin institutions regardless of where the Catawba tribal members live and wherever they chose to remain for employment.

## *Refinement of Screening Process*

To make its training activities more closely responsive to th changing demands of American industry for workers with specia skills, the Bureau has conducted intensive research and negotiate with a large number of employers throughout the country. This ha resulted in improved and much more sensitive screening of applicant for employment assistance and more effective service to the Indian who enter training. As one example, it has been found that a specially planned short course of 24 weeks in electronics will qualif graduates for remunerative jobs now available throughout th United States.

## *On-the-Job Training Activities*

With the increasing development of interest in location of industria plants on and near the reservations, the Employment Assistance staf has worked in close conjunction with other Bureau officials an industrial management in (1) screening and recommending eligibl applicants for on-the-job training; (2) providing followup services t workers and their families in orienting them to basic demands o steady employment; and (3) helping the trainees adapt to life in th community, make wise use of wages to meet practical needs of th family unit, and develop pride in the responsibilities of citizenshi and economic independence. The measure of the success of this typ of joint service to the on-the-job trainee has been evidenced by decrease in law-and-order problems, improved school attendance better nourished and better dressed citizens, some housing improvements and a noticeable awareness of living space and home furnishin standards, and generally improved acceptance by merchants in nearb communities. Outstanding results along this line were achieve during the year among workers in training at Pine Ridge and McLaughlin, S. Dak., Cherokee, N.C., and Hayward, Wis.

## *More Aid From ARA*

Under the Area Redevelopment Act the responsibility for plannin and furnishing retraining services to unemployed and underemploye persons is shared jointly by the Bureau of Indian Affairs with th Department of Commerce, the Department of Labor, and the Department of Health, Education, and Welfare. In carrying out thes sponsibilities, employment skills have been reviewed in communities ross the country and 16-week refresher and retraining courses have en submitted, approved, and put in operation. Several such courses re initiated during the year in predominantly Indian communities. ese included a project to train 200 workers for operation of the w sawmill on the Navajo Reservation, another to train 40 farm chinery operators on the Fort Berthold Reservation in North akota, a third to train 25 farm machinery operators on the Colorado ver Reservation in Arizona, and a fourth to train 16 apprentice rpenters for work on housing developments on and near the Pine dge Reservation in South Dakota.

## *anpower Act May Help*

Another possible resource for developing Indian occupational skills the program shaping up in the Department of Labor under the anpower Development Training Act. Although funds were not ailable for this program in fiscal 1962, the Bureau reached general reement with the Department of Labor that Indians should be lped under its provisions as soon as possible.

Prospects are that some additional assistance will be available from is source in fiscal 1963.

## *rogram Beneficiaries Increase*

The number of persons who received service of one kind or another der the Employment Assistance Program increased by roughly 30 rcent during the year rising to 12,005 as compared with 9,690 in 61. The table below shows the number of units (i.e., unattached dividuals or family groups) who received the various types of service ring the year and the total number of individuals who were nefited.

| | *Units* | *Persons* |
|---|---|---|
| location for direct employment | 1, 866 | 3, 494 |
| location for vocational training (institutional): | | |
| Training units carried over from previous years | 907 | 1, 898 |
| New units entered training during fiscal year 1962 | 1, 445 | 3, 035 |
| Total served during fiscal year 1962 | 2, 352 | 4, 933 |
| -the-job training services: | | |
| Training units carried over from previous year | 227 | 726 |
| New units entered training during fiscal year 1962 | 838 | 2, 745 |
| Total served during fiscal year 1962 | 1, 065 | 3, 471 |
| aining of California Indians (Public Law 85–671) | 30 | 68 |
| aining of Catawba Indians (Public Law 86–322) | 28 | 39 |
| Total units served by program fiscal year 1962 | 5, 341 | 12, 005 |

## Law and Order

As reported in previous years, legal jurisdictional problems continu to hinder or prevent the provision of adequate services for dependen or neglected Indian children on reservations in several States. Commitment of adult Indians, as well as children, to appropriate Stat institutions has also been hampered.

A New Mexico State court took the legal principle that a Stat has no jurisdiction over offenses by Indians within Indian reservation in the absence of congressional legislation providing such jurisdictio and applied this principle to the case of a non-Indian arrested withi a reservation by State authorities and dismissed charges against hin The case is on appeal to the State supreme court. In the meantim State law-enforcement authorities are continuing to enforce Stat laws against non-Indians within Indian reservations.

State authorities in Idaho, where the State had been assumin jurisdiction over offenses by Indians within the Coeur d'Alene an Nez Perce Reservations, questioned their jurisdiction to continu their activities on the basis of the U.S. Supreme Court's decision i *Seymour* v. *Schneckloth*, decided in January 1962. This decision hel that the town of East Omak was within the Colville Reservation an was therefore "Indian country" as that term is defined by law f the purpose of limiting Federal jurisdiction. At the close of th fiscal year, State authorities had all but ceased their maintenance law and order among Indians on these two reservations and it appeare that State legislation pursuant to the act of August 15, 1953 (Publ Law 280, 83d Cong.), would be necessary to clarify the jurisdiction situation or it might become necessary to reestablish Indian cour on these reservations.

The North Dakota Legislative Research Committee conducte a study, with hearings among Indian people on the reservations ar and other citizens, looking to the improvement of the status of India people in North Dakota. In the field of law and order, the committ indicated that it would recommend enactment of State legislatio to assume civil jurisdiction with respect to reservations but, in view the objections of the Indian people, would not recommend assumptio of criminal jurisdiction.

In 1957 the State of Washington enacted, pursuant to Publ Law 280, 83d Congress, a statute that permits the Governor, upo petition of a tribal council, to extend civil and criminal jurisdictio of the State to the Indian people on the reservation. Previously, such reservations were subjected to State jurisdiction. During t fiscal year 1962 one tribe, which had to date declined to petition t Governor for State jurisdiction, did present such a petition requesti

extension of State jurisdiction on a "piecemeal" basis. The re-
est included some areas of civil jurisdiction and some areas of
minal jurisdiction. This action was taken shortly before the close
the fiscal year and, at the close of the year, the request had not
en acted upon.

## Welfare

n fiscal 1962 the need of Indian families for general assistance
tinued to increase due mainly to the continued decrease in employ-
nt opportunities. The increase in provision of social services to
ilies and individuals, not receiving financial assistance, also con-
ued as well as requests for social services to the tribal courts.
ild welfare services to dependent, neglected, and handicapped
ldren received major attention, and counseling services in planning
structive use of restricted individual funds were provided to
lians in need of assistance in managing their affairs.

### *neral Assistance*

he trend in a steadily increasing caseload and expenditure for
eral assistance was due largely to lack of employment opportunities
unskilled labor because of continued mechanization of agricultural
rations. The average monthly caseload of persons was nearly
percent higher than in 1961 and expenditures for general assistance
1962 was over 22 percent higher than in 1961. The greatest
reases occurred in the Aberdeen, Billings, and Phoenix areas.

he number of needy Indians receiving general assistance followed
usual seasonal pattern from a low of 3,095 households of 8,864
sons in July to a high of 6,761 households of 23,302 persons in
ruary. The average monthly payment was $77.55 per household.
e average monthly caseload was 4,830 households of 15,642 persons.

### *cial Services*

ocial services were provided to all families, individuals, and
ldren in need of counseling or guidance when receiving general
istance. In addition, over 10,000 families and/or individuals, who
not receive general assistance, received counseling, guidance, and
istance in working through their individual problems.

ncreasingly, the Indian people on the reservations are coming to
social workers to ask for their services and the requests from the
al courts have overloaded the agency social workers' caseloads.

## *Child Welfare*

Special emphasis has continued to be placed on providing soci services to children in need of care, whether in their own homes, specialized institutions for the physically handicapped or mentally i in foster homes or in adoptive placement. During the year 2,4 children were under care.

The Indian adoption project conducted under a contract wi the Child Welfare League of America, whereby homeless children a referred by Bureau social workers on selected reservations for adopti placement to qualified adoptive agencies selected by the Child Welfa League of America, progressed satisfactorily. During the past yea 28 Indian children, ranging in age from birth to 7 years, were plac in adoptive homes in 13 different States. This brings the total children placed under this project to 63. Both public and priva child welfare agencies participated in these placements. The increa in the number of children placed, in the number of agencies pa ticipating, and in the number of States involved gives eviden of greater and more widespread interest in the problems of Indi children.

# *ureau of Land Management*

## arl S. Landstrom, *Director*

A new frontier in public land management was defined by President hn F. Kennedy in his two special messages to the Congress of the ited States. In 1961 he said:

> "Our country has been generous with us—we cannot now ignore her needs for future development."
>
> "The Federal Government owns nearly 770 million acres of public land—public domain lands amounting to some 477 million acres are a vital national reserve that should be devoted to productive use now and maintained for future generations."

In 1962 President Kennedy stated:

> "We must reaffirm our dedication to the sound practices of conservation which can be defined as the wise use of our natural environment; it is in the final analysis the highest form of national thrift—the prevention of waste and despoilment while preserving, improving, and renewing the quality and usefulness of all our resources. Our deep spiritual confidence that this nation will survive the perils of today—which may well be with us for decades to come—compels us to invest in our nation's future, to consider and meet our obligations to our children and the numberless generations that will follow."

Pointing directly at many of the needs, the President said:

> "Adequate outdoor recreational facilities are among the basic requirements of a sound national conservation program . . . the water that courses through our rivers and streams holds the key to fill national development . . . more intensive management is now being applied to public domain lands but still more needs to be done . . . timber growth, particularly in soft woods, must be increased significantly if we are to meet the nation's projected

> future requirements for wood products. The growing of tim is a long term project requiring concerted public and priv efforts and considerable advanced planning . . . during the l thirty years this nation has consumed more minerals than the peoples of the world had previously used but present availa ity of raw materials must not blind us to tomorrow's requ ments . . . in the work of conservation time should be m our friend not our adversary. Actions deferred are frequen opportunities lost, and in terms of financial outlay dollars vested today will yield great benefits in the years to come."

The steps taken by the Department of the Interior through Bureau of Land Management during fiscal 1962 to meet the challe laid down by the President are the subject of this report.

The responsibilities of the Bureau include the custodianship of national land reserve (167 million acres of public lands mostly in Western States), the public domain in Alaska (309 million acres), reinvested Oregon & California Railroad grant lands (2.1 mill acres), mineral leasing on the Outer Continental Shelf, and ot functions related to natural resources.

## *Public Land Anniversaries*

This year marked the sesquicentennial of Federal administratio public lands, which began in 1812 with the founding of the Gene Land Office, now the Bureau of Land Management.

In a special proclamation, President John F. Kennedy designa this year for official commemoration of significant anniversaries the history of the public domain. Three of these to be marked w the Homestead Act of 1862, the Land-Grant College Act of 1862, the Transcontinental Railroad Land-Grant Act of 1862. Spe ceremonies were held in all of the Western States.

The history of the Bureau is the history of the development of Nation. As the landlord of the public domain, the General L Office assisted in the development of the country through the tran of millions of acres to private citizens, colleges, railroads, States, others. From this same public domain were carved most of national parks, national forests, and Indian reservations.

This phase of our Nation's history has passed, and the emph has changed from disposal to management. The Bureau, perform the Nation's largest land managing job, has been prominent in c servation and land development.

## *Legislation*

Under the authority of the public land laws, more than 1.1 bil acres of the original public domain have been transferred to priv and other non-Federal ownership. Today the Bureau of Land Management is responsible for the conservation, management, and development of some 467 million acres of the Nation's public lands.

During 1962 the Department was active in studying the public land laws of the United States and formulating recommendations for their amendment and modernization. Special attention was given to drafting new legislation which would authorize land dispositions in a manner required to meet the needs of an increasingly industrialized and urbanized society.

One of the most important proposals asked by the Department was the so-called omnibus bill, which would authorize the classification, segregation, lease, and sale of public land for urban, business, and occupancy sites. Such a bill would repeal a number of obsolete or inadequate laws.

Another piece of legislation asked by the Department consisted of amendments to the homestead and desert land laws. It would provide for higher standards for the classification and development of

*The moratorium on public land applications, in effect during 1961, greatly aided the Bureau in its land classification work by providing time to deal with a large backlog of applications. Here two BLM specialists review the suitability of an area for recreational development.*

*Cows and calves graze contentedly on the Federal range, while a study grazing fee rates is being conducted to insure their future welfare.*

agricultural lands, and would require payment for the lands un terms more in keeping with the value of the resources.

Other legislation would amend Section 8 of the Taylor Grazing A by broadening the exchange provisions of the act. Such authori would permit consolidation and better management of the natio land reserve.

Another proposal sent to the Congress called for a revision of t right-of-way laws which would pull together and update a hodgepod outdated provisions. It would facilitate the granting of easements r needed private and public purposes.

Under existing law, lands valuable for locatable minerals may be sposed of only under the U.S. mining laws. Another proposal by the epartment calls for authority for the Secretary to dispose of mineral nds under the nonmineral laws when he finds that they are more luable for their surface uses and resources than for their mineral posits.

A proposal studied by the Bureau of Land Management would pro- de for the recordation of mining claims on the public lands and for system of exploration mining claims to cover the period prior to dis- very of valuable minerals.

Important legislation passed this year by the Congress included an t to repeal obsolete laws relating to military bounties. It provides at the Secretary of the Interior may purchase outstanding valid litary bounty land warrants for $1.25 per acre.

Another act passed by Congress authorized the Secretary to sell rtain lands in Idaho which were omitted in the original survey of e lands.

## *Lands and Recreation*

The public land laws provide the means by which the American blic may obtain patent to the public lands. But by 1961 the number applications for public lands had reached staggering proportions. permit the Bureau to eliminate this overwhelming backlog of plications, to review the land management situation, and to develop d management objectives, Secretary Stewart L. Udall ordered an -month moratorium in February 1961 on most kinds of applications public lands under the nonmineral public land laws.

The privilege of filing applications had in recent years been used some unethical land locators and promoters in an attempt to bilk e public out of millions of dollars. At the same time, the flood of omoter-inspired applications hampered honest citizens in their sires to acquire public lands.

By June 30, 1962, 2 months before the moratorium was scheduled expire, excellent progress had been made in reducing the backlog more than 41,000 applications. About 18,000 cases were left, a luction of 57 percent. Outside of Alaska, where the moratorium d only minor application because of the settlement laws, progress s even more encouraging with a two-thirds reduction The ratorium was lifted ahead of schedule in eight of the States affected it.

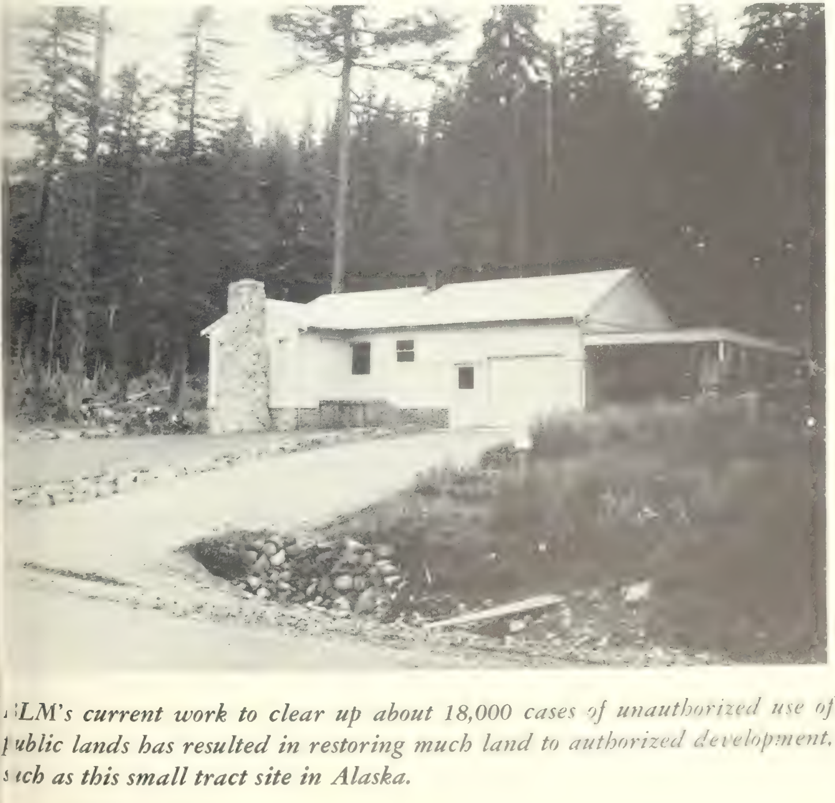
*Loon Lake in western Oregon is an example of the outstanding recreati l developments being constructed in the revested Oregon & California Railr d lands—where special funds are available for BLM developments of recrea i potentials. This popular site furnishes boat launching, swimming, picnick , and overnight camping.*

Sales of land and other dispositions were not stopped by e moratorium. Over 4,000 small tracts were offered for sale at pu c auction in southern California. Several other offices conduc l regularly scheduled public auctions of public lands. The morator n llowed the Bureau to take more timely actions on pending cases to eet the requirements for land of local communities and individuals.

## tudying the National Land Reserve

In direct response to the President's call for an "inventory and valuation of the Nation's public-domain holding" the Bureau put nto operation a master unit study system for the national land eserve. The system recognizes that these residual public-domain nds are attaining greater importance yearly, both as a reservoir of nderdeveloped land for intensive public and private use and as an rea needed for balanced resource use by the public in general.

The system also recognizes that land demands and uses are changing. mployees of the Bureau of Land Management working with the old gricultural land laws are aware that they are not operating in the anner popularly assumed. To determine what the facts really are, two-phase effectiveness study was started. Enough of the facts are to lead to some conclusions.



*LM's current work to clear up about 18,000 cases of unauthorized use of ublic lands has resulted in restoring much land to authorized development, uch as this small tract site in Alaska.*

The first part of the study covered the land applications under th Homestead Act, the Desert Land Act, and the Pittman Act for th 10-year period 1950–59 in 11 Western States.

Approximately 25,000 applications for public lands were filed unde the 3 acts during the period of the study. The results of the initia applications are as follows:

| Type | Percent allowed | Percent denied |
|---|---|---|
| Homestead applications | 14 | |
| Desert land applications | 17 | |
| Pittman Act applications | 11 | |

Chances for securing an entry—having an application approved- varied from State to State. Of the homestead entries allowed, 5 percent were in Nevada and Utah. Of the desert land entries, 6 percent of those allowed were in Idaho and Nevada. The Pittma Act applies only to Nevada.

Of those entries allowed, only about 50 percent of the homestea and desert land entries went to patent. Under the Pittman Act, onl about 1 out of 100 were patented.

## *New Programs*

A new type of public land management program has been introduce under Secretary Udall—the establishment of 11 national cooperati land and wildlife management areas in California. These areas a managed by the Bureau of Land Management for the developmen conservation, use, and maintenance of outdoor recreation faciliti as well as wildlife and other natural resources. Advice and cooper tion will be provided by the Department's Fish and Wildlife Servi and by the California State Game and Fish Department.

The public lands involved have been withdrawn from applicatio or entry under the nonmineral public land laws. The land will contin to be open for mining and mineral leasing, livestock grazing, publ outdoor recreation, and other uses administered by the Bureau Land Management.

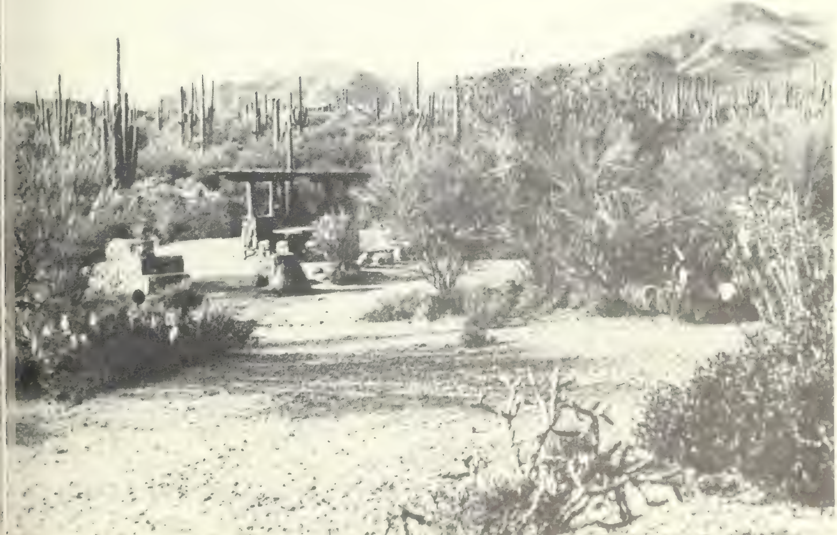
In another development, Secretary of Agriculture Orville Freeman and Secretary Stewart L. Udall initiated land jurisdictio studies involving the two Departments. The purpose is to impro the administrative boundaries of lands administered by the Fore Service and the Bureau of Land Management. Often the tw Departments have jurisdiction over adjacent stretches of land, ar some jurisdictional trades may prove desirable. The timetab stablished by the Secretaries sets January 1, 1963, as the target date or the first land adjustment proposals to be formalized.

## *ecreation on Public Lands*

A major gap in the national land program was identified by Secre- ary Udall when he announced on September 11, 1961, that: "The rovision of open spaces for outdoor recreation is one of the most nportant objectives of the national land reserve. Plans are to give ecreation the same degree of attention as is given the more traditional anagement programs for such resources as range, forage, commercial mberland and leasable and hardrock minerals."

The report of the Outdoor Recreation Resources Review Commis- ion also called attention to the long-standing neglect of this important ational resource.

To translate this new emphasis on outdoor recreation on the national nd reserve into constructive action, a continuing inventory and



*his Arizona park was developed under the Recreation and Public Purposes ct. A pricing schedule instituted in 1961 enables States to buy recreation nds for $2.50 an acre. Such minimal land costs permit States to develop reas more rapidly.*

*Management of recreational lands is getting increased attention und BLM's new programs. The visitor protection program provides waysi shelters and eliminates visitor hazards from recreation areas.*

evaluation of the existing and potential outdoor recreation resourc of these lands has been started.

Preliminary inventory information indicates that outdoor recreati is already an important activity—existing or potential—on ov 50 million acres of Bureau of Land Management lands, not includi Alaska. Over 4,000 sites involving 4½ million acres have be identified as suitable for intensive recreational use and the installati of facilities.

In the current inventory, first consideration is given to areas th have good potential as national parks, monuments, or recreation area

Another priority concerns areas that may be suitable for administr tion by States, counties, or municipalities. Many such areas ne established population centers or along public highways and oth special areas are being identified for lease or sale to local governmen under the Recreation and Public Purposes Act. These are areas th have potential for heavy use and are the most convenient for operati by local government. A special pricing schedule of $2.50 an ac was instituted this year which brings lands for recreation into t financial reach of many communities.

The Bureau of Land Management has constructed 22 camping and icnic sites on O&C lands in western Oregon. These include acilities. Need for recreation facilities exists on more than 2,500 dentified sites on the national land reserve. They are located in ultiple use resource management areas where the Bureau of Land anagement is in an excellent position to coordinate recreational ses with other uses.

# *Forest Resources*

To provide for the future needs of our growing Nation, the Bureau f Land Management is constantly alert to changing conditions which ffect the management of forest resources. The Bureau is planning r increased use of public lands entrusted to its care. In forest anagement an important goal is the growing of more wood fiber from wer acres.

By applying the latest techniques in forest management practices, e Bureau is striving to meet this challenging situation of intensive ultiple use of the Nation's forest lands.

## *niform Practices*

Following President Kennedy's request in 1961, the Secretaries of griculture and the Interior began a cooperative study of timber sale d management practices on Federal forest lands with the objective approaching uniformity in these practices.

Differences in timber sale practices and forest inventory proceures are being studied and evaluated. A group was designated to udy the inventory and allowable cut procedures of both agencies.

On August 28, 1937, the O&C Sustained Yield Act was signed to law. This marked the beginning of a sound forest policy for dministering a unique area of public forest lands in western Oregon. nce then, the U.S. Treasury has gained more than $30 million over d above all costs of acquiring, holding, and managing these 2.1 illion acres of some of the finest timber in the Nation.

During fiscal year 1962, the public-domain lands in western Oregon ere combined with the Oregon & California Railroad grant lands )&C) and the Coos Bay Wagon Road lands (CBWR) to calcute a new annual allowable cut of 977 million board feet—an increase 26 million feet over the previous allowable cut. This combination, us more refined inventory procedures, was followed within a month another allowable cut of 1.127 billion board feet—an increase of 1[illegible]6 million board feet. The volume of timber sold from these lands uring the past year totaled 834,339,400 board feet valued at

*BLM employees scale sugar pine trees to harvest cones resulting from co trolled hand pollination. Such methods produce strains which can res the pine blister rust, a deadly forest enemy.*

$20,409,831.12. Also contributing substantially to the economy western Oregon was 83,363,100 board feet of salvage and thinnin not chargeable against the allowable cut.

The Bureau of Land Management administers about 4 mill acres of other commercial forest lands in Western States in addit to 29 million acres classified as woodland from which a variety ood products are sold. Timber sales from public-domain lands ntributed almost 139 million board feet of timber valued at nearly million.

## *orestry Inventory*

A full and complete inventory of forest lands is necessary for stained-yield management. Permanent sample plots are being tablished so that periodic reinventory can be taken. This provides r accurate, up-to-date information, vital to management plans and lowable cut computations on the changing conditions of the forest nit.

## *eforestation*

To establish stable economic conditions of an area primarily dendent upon timber for its present and future livelihood, cutover nds must be promptly restored to a productive state. Loss of jobs d taxes results from reduced resource production. Recently cuter lands are subject to erosion and the invasion of undesirable ush species which hamper the growth of commercial species.

Reforestation accomplishments for the Bureau for 1962 include ,043 acres by planting and 16,424 acres by direct seeding. Total ea reforested up to July 1, 1962, on Bureau-administered lands nounts to 172,572 acres. By 1965, complete reforestation of backg acres on the O&C is planned. Completion on public domain scheduled for 1970. Thereafter, reforestation will be on a mainnance basis for denuded burns and recent cutover areas not adeuately reforested by natural means.

Bureau foresters, aware of the problems in obtaining adequate generation of some areas, are continually experimenting with new ethods of planting and seeding. One recent experiment involved e use of a heavy paper mulch around planted seedlings. Results owed that the paper reduced competition from grass and brush ljacent to the seedling, resulting in a significantly higher percentage seedling survival. The method has been widely used in areas nere moisture and vegetative competition are critical factors

In an effort to aid reforestation, site improvement treatments were ven to 7,054 acres of forest lands. Snags felled on 3,145 acres acunted for the largest acreage treated. Other site improvement actices included scarification of the forest floor, herbicide treatent—the application of chemicals to eliminate weed species and ulching.

## *Forest Thinning*

The prime objective of a thinning program is to produce select crop trees and remove salvage, competitive, or undesirable tree To this beneficial result is added additional income from the fore property by obtaining volume otherwise lost to natural cause During fiscal year 1962, 8,376,000 board feet of commercial thinnin were removed from approximately 1,226 acres in Oregon alone. Th represents bids totaling $127,532. Precommercial thinnings in stan having no merchantable volume or value under existing utilizati standards were completed on 420 acres.

In the past, management plans have been geared to the harvest old-growth timber. In a short time, the nation will be depende upon young growth to supply its needs. A study is being initiat in the Tillamook area of Oregon to analyze all aspects and effects intensively managed young-growth stands.

## *Access Roads*

A dynamic forest management program cannot be carried o without a good access road system. In order to place mature timb on the market and to salvage dead and dying timber due to ove maturity and wind throw, and to protect these forests from insect disease, and fire, the Bureau of Land Management has construct many miles of high-standard logging roads.

Access roads serve other important uses. As the trend continu toward increasing acreage of second-growth timber to be manage thinning programs are more important. Roadbuilding, added the cost of the actual thinning of small material, may make the oper tion a financial impossibility, especially for small operators. Th full utilization of forest property may not be realized.

Access roads serve many types of recreational use including fishin hunting, and picnicking, and provide a means of making many acres public lands accessible to the public.

# *Range Resources*

The Bureau of Land Management is responsible for the administr tion, conservation, protection, and development of the range resour of public lands.

Basic to the management of the Nation's grazing lands is inventory of the forage resources. The Bureau has intensified i fforts to complete such an inventory. Initial grazing capacities have een established by means of forage inventories on about 70 percent f the 158 million acres of public rangelands included within grazing istricts. These inventories provide the basis for stocking and anagement of the range to ultimately realize maximum sustained ivestock and game production. Reappraisals will be necessary from ime to time in the future to enable the matching of grazing use with he changes in range condition and forage production.

*hese bighorn elk shared the Federal range with about 1.4 million other ig-game animals in the past fiscal year.*

Modification of range survey procedures have been made in some istricts to further refine results. More accurate qualification of urvey data has been possible as actual use data, utilization studies r different forage plants, and the influence of annual weather ariations have become available.

## *ublic Land Range Appraisal*

In accordance with a request contained in the Senate Report o. 294 which accompanied the 1962 Department of the Interior ppropriation bill, a trial program for an appraisal of public rangelands was conducted jointly with the Forest Service, U.S. Departmen of Agriculture. This study embraced three sample areas in Oregon Montana, and Colorado. Data were assembled on range conditio and trend, present and potential grazing capacity, needed improvements, and related items.

A report, together with a prospectus for the public land rang appraisal, was submitted to the Congress. The prospectus containe estimates of cost and time needed to complete an overall rang appraisal by alternative procedures.

The report shows results such as the following in the three areas:

*Colorado* (San Luis Valley): Vegetation conditions were largely fai or poor. The pattern held true through all major vegetation type with the exception of the meadows.

Soil stability conditions were fair on about one-half the area Most of the remaining acreage was good or poor—in about equa proportions. Soil stability was good on one-half or more of th meadow, conifer, and broadleaf type acreage. However, nearly al of the grassland and half shrub types displayed fair or poor soi stability. Excellent vegetation and soil stability conditions wer found only in large cattle allotments. Summer ranges showed greater proportion in poor or very poor condition than spring-fal or winter ranges. Very poor conditions were confined entirely t summer allotments.

Ranges in poor or very poor vegetation condition and others in downward trend made up 40 percent of the total acreage.

Existing range improvements represent an investment averagin $1.15 per acre of Federal lands suitable for domestic livestock grazing Needed improvements will cost an average of $2.45 per acre.

In the past, stock trails, access roads, and fences received the mos emphasis. Range seeding, plant control, and water runoff measure are now considered to need more emphasis.

The average current capacity was 64 animal unit months pe section of suitable range. Average potential-capacity was estimate at 71 animal unit months per section.

*Montana* (Beaverhead and Madison Counties): Vegetation and soi stability conditions were rated good or fair on 90 percent or more o the range sampled. Meadow and conifer types had higher proportions in good condition than did other major types. Grasslands an meadows were the only types having an excellent vegetation rating but all major types had a small proportion displaying excellent soi stability conditions.

The large allotments and summer ranges had a higher proportion i the poorer condition classes than did the small allotments and spring fall ranges.

Ranges in poor or very poor vegetation condition and other ranges with a downward trend made up 34 percent of the total acreage.

Existing improvements represent an investment averaging $2.50 per acre of suitable rangeland. Needed improvements will cost an average of $5.65 per acre.

In the past, most of the improvement dollars were spent on fencing and sagebrush control. These practices will continue to receive the most emphasis, but large investments are also needed for stock water development, construction of roads and trails, and for allotment boundary marking.

Fences received most of the past investment dollars on cattle allotments, while most of the funds expended on sheep allotments were for sagebrush control. In the future, plant control as well as fencing will be emphasized.

The average current capacity was estimated at 194 animal unit months per section of suitable range. Upon attaining potential capacity an average of 278 animal unit months per section will be available for grazing.

*Oregon* (Lakeview area): Most of the vegetation was in the less desirable condition classes. Soil stability conditions were somewhat better, a large proportion being in fair or good categories.

Poor or very poor vegetation conditions predominated in all major types with the exception of the conifer. This type, although having a large proportion in poor condition, also had a sizable proportion in fair and good condition and a small amount in the excellent class.

The conifer type, with one-half of its acreage displaying good or excellent soil stability, was in the best condition in that respect. However, all of the major types in the Oregon area showed a preponderance of fair or better soil stability.

Ranges in poor or very poor vegetation condition and others with a downward trend made up 70 percent of the total acreage.

Existing improvements represent an investment averaging 35 cents per acre of suitable rangeland. Needed improvements will average 65 cents per acre. The report states, however, that these estimates appear unrealistically low.

In the past, fencing received the most empahsis. Fencing will continue, but other improvement needs including seeding, plant control, stock water development, and roads and trails will receive increasing emphasis.

The average current capacity was 44 animal unit months per section. Upon reaching potential capacity, an average of 60 animal unit months per section will be available for grazing.

## *Range Condition and Trend*

Range condition studies have been vigorously pursued in order t attain cumulative yearly information which makes possible th refinement of data gathered by the forage resource inventory.

The cumulative summary for the calendar years 1955 through 196 shows the following classification of range conditions for the usabl rangeland area: Excellent, 1.6 percent; good, 15 percent; fair, 53. percent; poor, 25.8 percent; and bad, 4.5 percent. The trend o range condition for the same area at this time is reported to be 2 percent improving and 17 percent declining. The remaining 6 percent is either static or was given no rating.

The changes from reports of preceding years are small, but the represent some evidence of improvement over the declining trend tha has prevailed for many years. Most States report some ranges a still declining, but there are some States that have definite areas o improvement.

Rehabilitation of ranges through better management, by greate use of range seedings, and by construction of improvement facilitie is credited with part of this improvement. Damage from fire durin the year was much less than normal.

A few States reported subnormal precipitation, but in most area the past winter and spring have been the best in many years. A the fiscal year drew to a close, it appeared that the long drought o recent years has been broken.

## *Study of Ranch Economics*

A study of ranch economics by the Economic Research Service o the Department of Agriculture and three State agricultural experimen stations under cooperative agreements with the Bureau of Lan Management and the Forest Service was conducted during the yea Basic economic data were collected from 700 western rancher Budgets on costs and returns were completed for 80 typical ranche representing several sizes and 27 ranch types using public range This is the first extensive research project to study livestock ranche throughout the West uniformly and simultaneously.

The study will yield factual information on how modern range live stock ranches are operated, what their long term costs and incom situations are, how significant grazing fees are as part of ranch operating costs, how increased grazing fees will affect ranch incomes, an how adjustments in grazing privileges affect stability of ranc operations.

*A rangeland plow removes sagebrush to allow grass to take its place. Under careful management, about 20 percent of overused rangeland is now improving in quality.*

## *Grazing Fees*

Consideration has been given during the reporting period to the basis and situation concerning grazing fees charged for the use of public lands administered through the Bureau of Land Management. Various economic and appraisal data have been obtained and carefully analyzed. The effect of fees upon the costs and returns of ranches has been investigated.

The National Advisory Board Council and the State and district advisory boards were asked to complete a study of grazing fees and make their recommendations concerning proper and equitable charges for grazing use of the Federal range. The board members considered various kinds of economic and value data including a preliminary report of the economic ranch study by the Economic Research Service.

## *Research*

The challenge of public land management could not possibly be met without better basic data obtainable only through research.

The Bureau has increased its cooperation with Department of Agriculture research agencies and the land-grant colleges and experiment stations.

Grazing trials on cheatgrass ranges and depleted watersheds are being conducted by the Forest Service in cooperation with the Bureau of Land Management. Vegetation conversion studies, including the replacement of Medusahead wildrye, halogeton, and other noxious weeds; revegetation of cheatgrass, salt desert, and other low rainfall ranges; and the control of several low-value brush species are being conducted in cooperation with the Agricultural Research Service and several State agricultural experiment stations. The Department's Geological Survey also participates in these projects. Economic studies are made by the Economic Research Service and the State experiment stations under cooperative arrangements.

## *Utilization Surveys*

Studies of current utilization of forage species are conducted on certain areas of the range which involve a particular management problem. Some of these include livestock and game use concentration areas, allotments scheduled for intensive improvement, and range survey areas for which proper use data is needed.

These surveys provide guides for livestock use adjustments and the establishment of hunting regulations in cooperation with State and Federal game managing agencies. Care is taken to consider the normality of current forage production in connection with utilization surveys.

## *Range Adjudication*

Current plans provide for the completion of range adjudication by July 1, 1967. Early completion of this activity is of utmost importance since it provides the base from which an intensive range management program can proceed. Range adjudication includes the determination of the extent of individual base property qualification for use of the range and the equitable apportionment of the available forage production among the applicants within the proper grazing capacity and season of use of the range.

## *Wildlife*

The rapidly accelerating need for outdoor recreation makes i desirable and necessary that the public lands make the greates contribution possible in providing wildlife enjoyment opportunities i balance with other needs and uses of the resource.

Maximum sustained yields of wildlife can be obtained only through proper management of wildlife habitat. To assist in obtaining this ultimate objective, wildlife biologists or game management specialists were added to the Bureau staff in most of the Western States. During the year the total number of big-game animals that used the Federal range (exclusive of Alaska) increased from an estimated 1,382,323 to ,409,347.

### Resource Development and Conservation

The Bureau realized that to meet the challenge of the 1960's the watershed planning effort would have to be greatly accelerated. Steps were taken to put the planning on a sound basis and to give it its required priority.

The inventory of presently serviceable projects which was underway at the beginning of the year was speeded up by an all-out effort. All projects which were no longer needed, which were beyond repair or for other reasons were deemed unnecessary, have been abandoned. Required maintenance work on other projects has been noted and integrated into current work plans. Conservation surveys have been carried out either in conjunction with range forage inventories or in addition to these studies to determine the total needs of each watershed.

A statement of the Bureau's development and conservation needs was compiled and issued. A schedule was worked out whereby the soil and moisture conservation program would be expanded over a 5-year period to reach a level at which the job can be accomplished within a reasonable time.

During this period of accelerated planning, several new approaches to the problem were analyzed. The one which seemed most suitable was a "project area" approach, similar to that used for water use and control projects. Under this concept field offices would delineate an area for complete conservation treatment. This may be a community watershed, a group of community watersheds, or an entire district. If the plan is approved, appropriations would be requested for the construction phases of the project program. Four such areas were delineated and have been approved for initiation in fiscal year 1963. The four projects are in the Vale district of eastern Oregon, Owyhee district in Idaho, the Winnemucca district in Nevada, and on the Rio Puerco watershed in New Mexico.

Nineteen hundred and sixty-two was the second year in which supplemental appropriations were obtained for the rehabilitation of burned out lands. The Bureau received $1,250,000 for the reforestation of forest lands and the seeding of rangelands damaged by fire.

## *Weed Control*

The Bureau recognizes that the large majority of weed problems are solved through the soil and moisture conservation program and improved management. Nevertheless, action is taken to control weeds which are posing a particular problem in a local area, either because they are poisonous to livestock or serve as reservoirs for reinfestations of agricultural lands or for other reasons. Primary emphasis in the control, research, and study programs are concerned with halogeton, Medusahead rye, and alternate host plants of the beet leafhopper.

Halogeton, a plant poisonous to livestock, has been at the top of the list for weed control since 1952. No method of complete eradication is known. Objectives now are aimed at controlling the density of the plants and furnishing sufficient usable forage so that livestock will not eat a large enough quantity of halogeton to cause death.

The infestation of Medusahead rye, an aggressive invader, has more recently reached such proportions that it must be controlled. Cooperative research projects are being pushed for methods to control this weedy species through range seeding and management, as well as by chemical methods.

The beet leafhopper, carrier of curly top virus, has caused millions of dollars worth of damage to seed-bean growers in southern Idaho. Alternate host plants used by this insect are Russian thistle, mustard, and other annual weeds growing on nearby rangelands. The thistle, mustard, and other weeds are not particularly difficult to control, but in southern Idaho they grow in conjuction with dense stands of cheatgrass. The cheatgrass makes the establishment of perennial grass species a difficult undertaking. Research on control of cheatgrass and the establishment of perennial grasses in such cover is being carried on. Land treatment practices are going forward in those areas which are predominantly covered by big sagebrush where success is fairly well assured.

Other weeds of local importance include snakeweed, larkspur, whitetop Russian knapweed, wyethia, leafy spurge, and camelthorn. In addition, the States bordering Mexico are apprehensive about a new poisonous weed which is threatening to invade from that country called Alfrombia.

# *Mineral Resources*

The Bureau administers the disposition of the mineral interests of the United States, including those on forest lands, acquired lands, military reservations, parks, monuments, etc., and the Outer Continental Shelf, in addition to public lands otherwise administered. These ineral interests afford a sizable part of the country's mineral output ıd contain many reserves needed to sustain the activities of the inerals industry.

In line with the President's natural resources messages, the Bureau Land Management instituted a program designed to create a bal- ıced use of the country's lands and natural resources, responsive to e needs of the public and consistent with acceptable conservation actices.

Under this program, the Bureau will make a comprehensive analysis the mineral resources, both existing and potential, found on the ıblic lands. The data will be given consideration in all decisions lating to the management of the national land reserve.

In order to obtain the information on which to base its decision, the ıreau has undertaken a project to compile information on the mineral sources of the lands it administers. The initial inventory is sched- ed for completion by the end of the 1963 fiscal year. Once this ta is cataloged and compiled, it will be analyzed in detail and inte- ated with the results of a minerals economic study that is to be nducted concurrently and the results will be embodied in the ıreau's overall resource management program. All data and alyses will be updated and reevaluated in light of any significant ineral discoveries and advances in mineral technology.

One of the objectives of the project is to prevent the inclusion of luable mineral lands in developments not compatible with mineral ploration and exploitation.

In an effort to keep pace with the social and economic growth of the untry, the Bureau has encouraged study of ways to modernize the neral mining laws of 1872. A draft of proposed revisions was stributed within the minerals industry and to interested organiza- ons for review and comment. A number of recommendations and ggestions were received and are being considered.

## *laska*

Oil and gas production increased sharply in Alaska during the year, tably on the Kenai Peninsula. In view of the extremely high cost mineral exploration in Alaska and the operational difficulties in latively undeveloped areas, the development of these new oil and s fields must be looked upon as a major accomplishment in the velopment of the Alaskan mineral resources. The discovery and oduction of large quantities of oil and gas should accelerate the eco- mic growth of the State and provide additional stimulus to future ineral exploration.

### *Outer Continental Shelf*

Interest in mineral leasing on the Outer Continental Shelf continue throughout the year and bonus bids received for the 1.913 million acr leased during the period totaled approximately $446 million. In a dition to the offshore oil and gas activity, considerable interest w shown in other minerals. Leases were issued for salt and sulfur in tl Gulf of Mexico and for phosphorite on the submerged lands off tl coast of California.

Preliminary investigations indicate that, once techniques are d veloped for the economic exploitation of these underwater miner deposits, they will add considerably to the Nation's usable miner reserves. It is expected that one day, a substantial amount of tl Department's work will be involved in offshore mineral leasi activities.

### *Statistics*

Preliminary figures representative of the scope of mineral activiti during the 1962 fiscal year follow:

| | |
|---|---|
| Oil and gas filings and lease applications* | 222, 8 |
| Other lease applications (sodium, potassium, etc.) | 5, |
| Mineral patent applications received | 1 |
| Mineral classification and investigation cases processed | 15, 2 |
| Mining claims involved in mineral contests | 4 |
| Acres involved in Public Law 167 determinations (combined Forest Service and Bureau of Land Management) | 28, 143, 8 |

*Includes simultaneous filings.

## *Protection of Resources*

It is essential that the lands and resources under BLM jurisdicti be protected against the destructive forces of nature and the careles ness and willfulness of man. The protection of these resources cove many fields—prevention and suppression of wildlife, control of u authorized use, control of insects and diseases destroying forests, a protection of visitors on the national land reserve.

### *Fire Control*

Fire has become one of the principal enemies of forests, rangelan and watersheds. During calendar year 1961, the number of fires a area burned was less than the 5-year average. The total of 1,0 fires burned 147,259 acres, compared with the 5-year average of 1,4 fires which burn 1,433,291 acres annually. The fire control objecti was to train, organize, and develop a force to hold losses to a minimu

*orest fires destroy many valuable acres of public lands. This year, the umber of fires and acreage burned was less than the 5-year average. The umber of fires was 333 below the average.*

## *ire Conditions*

Generally favorable fire weather resulted in depressed burning con-
tions in Alaska with fire occurrence much below previous years.
other States, fire conditions were quite varied. Most States ex-
rienced dry spring weather following reduced winter precipitation
hich resulted in early curing and drying of herbaceous plants and
rly conditioning of heavier fuels in higher elevations for rapid burn-
g. Summer rains in some States relieved the drought conditions
d reduced the fire hazards. Fire fuels were reduced by spring
ought conditions which was reflected in fewer fires and less rapid
read of those which occurred. The combination of these elements,
upled with aggressive attacks, aided in holding resource losses to a
inimum.

## *ightning Fires*

Lightning caused 62 percent of the fires suppressed by the Bureau of
and Management in 1962, compared to 49 percent during the calen-
r year 1960. Oregon experienced the greatest increase of lightning
es, amounting to nearly 50 percent.

## *Availability and Effectiveness of Firefighters*

Organized Bureau suppression teams were used very effectively i several States. These crews, well trained and mobile, though few i number, were effective in reaching and suppressing fires while the were small. The Bureau, in cooperation with other fire protectio agencies, participated in the organization and training of Indian an Mexican crews in New Mexico, Arizona, Nevada, Idaho, and Montan In Alaska, the Bureau organized and trained Eskimo and India crews, as well as 20 smokejumpers. The specially trained and organized crews have been a great asset to the protection of lands and resources, supplementing the Bureau's regular personnel, particularl on project fires. The distribution of these highly trained and organized crews in strategic locations supplies a source of manpower s urgently necessary to combat large fires.

## *Adequacy of Protection*

It is recognized that there are insufficient ground detection faciliti on lands protected by the Bureau of Land Management's own sta This continues to be an obstacle in obtaining prompt action on all fire In spite of an intensive aerial surveillance, fires originate and sprea over large acreages before they are detected and reported. The lac of an adequate network of truck trails and roads into large blocks public lands delays prompt suppression of reported fires. Sever years may elapse before the deficiencies existing will be overcome an the complement of lookouts, roads, and other operating facilities wi reach a satisfactory operating standard.

## *Contract Fire Protection*

Lands administered by the Bureau which are protected from fi by other protection agencies in Idaho, New Mexico, Oregon, Washington, and Minnesota experienced a season with above-norm climatic conditions. Lightning caused about 75 percent of the tot number of reported fires on lands protected by contract.

## *Air Operations*

Use of aircraft during calendar year 1961 increased nearly 1 percent over the 1959 season, and 29 percent over the 1960 fi season. More than 124,000 gallons of fire retardants were droppe on fires suppressed by the Bureau, with 82 percent effectiveness of a aerial drops. The slurry used consisted of bentonite and sodium-calcium borate as the retardant. Bentonite has been used predominately on light fuels and borate on heavier and deeper fuel type ach has been very effective when applied with wise consideration f the situation.

## ontrol of Unauthorized Use

The primary responsibility is the elimination of unauthorized uses rough public education and the development and maintenance of a ositive system of control, supported by a vigorous investigation and nforcement program. Unauthorized use has become a chronic oblem on the national land reserve, and a deterrent to sound and fective management.

There is an estimated backlog of various types of unauthorized se of 17,653 known or suspected cases, with a resource value of over 6 million. These cases range from the unintentional to the criminal d are widespread in all the public land States. During 1962 a bstantial inroad was made in the reduction of timber trespass.

## isease Control

A serious tree disease affecting timber administered by the Bureau Land Management is white pine blister rust, a disease common to five-needle pines. Eradication of the alternate host plant is the incipal measure so far used for control. The alternate hosts for ite pine blister rust are several species of a kind of wild berry lled *Ribes*. *Ribes* eradication was conducted on forest lands in regon where sugar pine stands make up the major species of com- ercial timber. During the 1961 field season, 184,000 *Ribes* plants re treated and destroyed on approximately 1,500 acres.

## isease Suppression

There are two additional possibilities for control of blister rust ich appear promising. One is the treatment of infected trees th a type of antibiotic. During the 1961 field season, 6,875 trees re treated on an area covering 181 acres. Studies and experi- entation with the antibiotic for treatment of infected trees have not ncluded that full-scale use should be made. However, apparent sults point out its potential effectiveness.

Tree breeding also offers a great potential as a successful control easure. Cones from rust-resistant trees have been control-pollinated produce a seed source. Cones from these trees should produce veral pounds of seed to increase planting stock and continue the e breeding program. Eventually either one or the other, or perhaps combination of the two ventures, will replace present control ethods of grubbing or chemically treating *Ribes* plants.

## *Insect Control*

Insect infestations are difficult to detect and may cause considerab damage before reported. They may reach epidemic proportio before adequate control measures are effective. While they are le spectacular, annual damage by insects exceeds that caused by fi Damage by fire promotes breeding of many species of insects– vicious circle.

Infestations of bark beetles are reported in Montana, Colorad California, and Wyoming. The most serious of these infestations w that of the Black Hills beetle in Wyoming. Control projects enco passed more than 76,000 acres—over 7,000 trees were hand treate Adequate control of the infested areas is expected to extend over years.

## *Visitor Protection*

The accelerated impetus being given to recreation programs a the increased public use of the national land reserve have made i necessary that a visitor protection program be inaugurated.

The long-range objective is to identify, isolate, and correct hazar that threaten the general welfare and safety of public land recre tionists; to provide for guidance to areas of natural interest, and t wayside shelters; to provide sanitation facilities and warnings garding the existence of natural hazards; and to develop organizatio expertise in the conduct of search-and-rescue operations.

During the second half of 1962, the visitor protection program w initiated and steps were taken in the training of personnel. Pla were laid for a progressive and unified program in cooperation w public safety officers, public peace officers, rescue forces, and recr tion agencies.

# *Engineering*

Before lands can be efficiently managed, physically identifi or before the title can be transferred, the lands must be provided w a legal description and acreage, and marked on the ground so that th boundaries are fixed by monumentation. The public land surv provide these necessary "first steps" as the basis for subsequent ma agement and administrative activities, not only for this Bureau but all lands originally in the public domain. These surveys, together w the plats of survey which are their graphic representations, constit the foundation land record which is the "starting point" for all sub quent transactions. No title action or transfer of lands surveyed un

*A BLM engineer checks an original survey marker moved by the sea in Auk Bay, Alaska. Although only 1 percent of Alaska's 360 million acres has een surveyed, photogrammetry and other modern methods make it possible o survey large areas quickly.*

he public land survey system, public or private, can be made without ference to these land records.

Furthermore, it is absolutely essential that on-the-ground inventory nd management resource personnel— in addition to all users of the blic land—be able to locate themselves in relation to property lines. his is the practical "down to earth" contribution of the system of blic land surveys.

## *rveys in the Public Land States*

Although there remain some 112 million acres of unsurveyed public nd in the public land States (not counting Alaska), much of this ea is in permanent withdrawals or reservations where there is little mediate demand for original surveys. However, in recent years ere has been a concerted effort to survey the remaining common ool sections in the unsurveyed public lands outside the national ests, parks, and wildlife refuges. Such surveys are necessary before e to the school lands can pass to the States. Since the States have the option of selecting "lieu" lands for unsurveyed school lands fallin within permanent reserves, surveys of these areas for the sole purpos of identifying school lands are seldom necessary. This project is no substantially complete. While there will continue to be a demand f some original surveys, particularly in such States as Arizona, Nevad and California, the cadastral survey emphasis in recent years has bee and will continue to be, on resurveys. Original surveys of so 425,000 acres were accepted during the fiscal year and over 3 millio acres were surveyed in the field.

## *Resurveys*

Resurveys are needed for the principal reason that much of the ev dence of the original surveys which were made 50 to 150 years ago h either disappeared or is becoming more difficult to identify. In t extensive farming areas, the first settlers quickly erected fences constructed roads along their common property lines. Thus, the lines have been perpetuated. In the more remote areas, the bound ries of lands taken up for stockraising or other nonintensive uses, whi presumably identifiable by the original locator, have with the passag of years and ownerships become obliterated in many cases. This h come about because of the ravages of time, impermanent origin monuments, natural destructive forces such as erosion, animals, an probably most important—the works of man. Since much of th category of land is intermingled public and private, it is becomi increasingly important for management and administrative operatio to identify the boundaries of the public lands. The private landown also benefits indirectly from these resurveys since the boundaries his lands common with the public land are resurveyed and marked the same time. The generally increasing value of real estate al contributes to the demand for resurveys.

A large number of special-purpose resurveys were made during t year in the extremely valuable timberlands for timber sale purpos and to detect and locate timber trespasses as a basis for either ci or criminal prosecution. Resurveys also were made to segregate loc tions under the mining laws to permit the surface use of the land und the land laws.

Cooperative projects with the Forest Service to remonument pub land survey corners of the boundaries of the western national fores were well underway in fiscal year 1962. Under a cooperative agre ment, Forest Service personnel search for original corner eviden which is inspected and examined on the ground by cadastral enginee who either accept or reject it. If accepted, the original corner eviden is perpetuated by the setting of a Bureau of Land Management stan

d brass-capped iron post. Such reestablishment is made a part of
e official survey records.

A major and unique project that was successfully completed in fiscal
ar 1962 was the lower Colorado River cadastral survey project.
nder this project, all public and acquired lands of the Bureau of
eclamation were surveyed along the Colorado River extending from
e Mexican border to Nevada, some 150 miles. At the same time,
me riparian surveys of Indian reservations were made for the Bureau
Indian Affairs. Extensive historical, geological, and local research
d investigations were required to provide the background necessary
make these surveys. These surveys required the application of
rious legal principles and riparian techniques. Among other compli-
tions, they involved a determination of the nature and character of

*reign experts in land and range conservation were guests of the Bureau of
nd Management during a tour of forage improvement projects in Colorado.
e visitors came from 10 new and developing nations.*

the changes of the erratic Colorado River and were among the m difficult surveys to come before this Bureau.

Nearly 930,000 acres of resurveys were accepted during the fis year in addition to nearly 100 supplemental plats. Supplemen plats are those prepared from information available in the office a do not require fieldwork. They are constructed in most cases t provide a description and acreage of a tract of land which cannot described by existing plats of survey.

## *Alaska Surveys*

Only about 1 percent of Alaska's area of some 360 million ac has been cadastrally surveyed. While there are some rectangu surveys, most activity in Alaska prior to statehood was metes a bounds surveys of irregular tracts known as "U.S. surveys." Ho ever, with the advent of statehood and large congressional grants public land to the new State, there has been an acceleration of surv activities in Alaska.

The land grants to Alaska provide that the State can select, i 25 years, either surveyed land or unsurveyed land in compact uni with minimum amounts of 5,760 acres, up to a total of more th 103 million acres. Consequently, survey operations in Alaska a directed principally to the survey of the areas of unsurveyed la selected by the State.

In view of the magnitude of the job and the physical characterist of Alaska, every new modern surveying technique is being employ Photogrammetry is the principal method of survey used for the s vey of State selections, with electronic measuring devices also bei employed. Helicopters are the standard means of transportation aw from the few roads. In order to clear the title of lands selected the State, an expanded program of the execution of U.S. surveys h been necessary. Since rights can be acquired by a valid location the public lands, it is necessary that these locations be segrega by survey before the adjoining lands can pass to the State.

During fiscal year 1962, some 2¾ million acres of rectangular, St selection, and U.S. surveys were executed in the field, and 137, acres of surveys were accepted in addition to 29 supplemental pla

## *Outer Continental Shelf*

Six leasing maps of the Outer Continental Shelf off California, tending from Point Conception to the Oregon boundary, were p lished during the year. These maps extend seaward to depths 600 feet and aggregate an area of 4 million acres. Leasing m are required for the leasing of any areas on the Outer Continental Shelf for mineral leasing purposes.

### *Construction*

A branch of design and construction was established in the Bureau his year. The primary goal was the programing and development of civil engineering activities such as design and construction of resource development and conservation projects, access roads, buildings, nd facilities, including recreation.

Wise use and conservation of the public lands and resources requires ccess to the areas of operation. Accordingly, access roads must be esigned and constructed to serve the resources—varying from roads or heavy logging operations to roads needed for range management, ecreational activities, and other resource management requirements.

A handbook has been published showing map symbols for use by all cartographic personnel in the preparation of maps made for Bureauwide use in connection with resource management responsibility. These symbols will standardize as to feature, dimension, and characteristic all mapping symbols used in the Bureau.

Groundwork has been laid looking toward the standardization of buildings and facilities required in field operations and the standardization of contracting procedures for construction contracts.

### *Communications*

During the year, communications were upgraded and a branch of communications engineering was established within the Bureau. The paramount aims were the programing and developing of communication systems to meet the Bureau's needs.

The initial goal was to increase personnel and equipment as far as funds permitted. One aim was to reduce unsupervised contractual maintenance service to a minimum and another to extend and improve communications coverage. An estimated 10-percent increase in coverage had been accomplished by the end of fiscal year 1962, while a large percentage of contractual maintenance service was replaced by civil service employees.

Considerable progress was made in the improvement of systems engineering. Standards were established in engineering with emphasis on equipment and better utilization of available radiofrequencies. The aim of such standards is to make more modern equipment available with some savings to the Government and to improve communications.

Research and development of equipment without any expenditure of funds was initiated and resulted in one model which included some of the Bureau's recommended engineering being in use at the en of the year. Two other units of radio equipment which will bett meet fire control needs are under discussion. One is intended t improve aerial fire control which has been handicapped in the pa by the lack of frequency compatibility and by inadequate equipmen

## *Staffing*

As of June 30, 1962, the Bureau of Land Management had 3,07 permanent employees, 314 of whom were at headquarters in Washington. At that time there were also 1,300 seasonal employees.

Permanent employees assigned to State, field administrative, an district offices were as follows: Colorado, 288; Montana, 180; Ne Mexico, 190; Wyoming, 180; Arizona, 125; Idaho, 174; Nevada, 16 Utah, 232; California, 271; Oregon, 642; and Alaska, 289. Reportin directly to the Washington office were the additional permaner employees: four with the Outer Continental Shelf office in Louisian three with the office in Minnesota, six field committee personnel i various Western States, and six auditors.

## *Finance*

Total appropriations during fiscal year 1962 for operations the Bureau of Land Management were: Management of lands an resources, $34,575,000; construction, $1,050,000; O. & C. grant land $7,835,844; range improvements, $739,842; and Public Lands Admi istration Act, $463,645.

During fiscal year 1962 the Bureau of Land Management receive from the sale and management of public lands and resources a tot of $173,517,502. These receipts came principally from miner leases and permits; timber sales; sales of public lands and material grazing leases, licenses, and permits; fees and commissions; ar leasing of rights-of-way.

Receipts of the Bureau of Land Management for fiscal year 196 were distributed as follows: $61,533,133 to 27 public land States, which $15,400,136 went to the 18 western Oregon timberland countie $59,117,434 deposited to the reclamation fund; $48,128,179 to th general fund of the Treasury; $3,794,200 transferred to other Gover ment agencies; $248,031 earmarked for Indian trust funds; an $696,525 returned to the grazing districts for range improvement

Grand total of all receipts of the Bureau of Land Management an its predecessor agencies is $2,596,530,333. Since 1946, when th Bureau of Land Management was established, receipts tot $1,859,885,180.

# National Park Service

## onrad L. Wirth, *Director*

# *Enjoyment of A Heritage; Protection of A Legacy*

At the White House Conference on Conservation last spring, resident John F. Kennedy said: "I don't think there is anything hat could occupy our attention with more distinction than trying to eserve for those who come after us this beautiful country which e have inherited."

In the spirit of this message, and during a year in which Secretary the Interior Stewart L. Udall called for a national conservation fort "to secure an adequate resources base for the future, and to an the use of our land resources so that material progress and the eation of a life-giving environment will go hand in hand," the epartment's National Park Service:

— Established a close working relationship with the new Recreation Advisory Council and the recently established Bureau of Outdoor Recreation in the common mission to bring about improved interagency cooperation and to develop coordinated national outdoor recreation policies.

— Saw three new areas added to the National Park System: Cape Cod National Seashore, Massachusetts; City of Refuge National Historical Park, Hawaii; and Buck Island Reef National Monument near St. Croix in the Virgin Islands.

— Recorded over 82,300,000 visits to national parks and related areas, representing an increase of 8.6 percent over the previous year.

— Observed a 4.4-percent increase in camping, with over 5,051,000 camper days recorded.

— Entered into a contract with the National Academy
Sciences, initiating a study of natural history research needs
the national parks. The Academy, on the basis of its finding
will advise and make recommendations for a research progra
designed to provide data for effective protection, managemen
development and interpretation of the national parks, and
encourage greater use of the national parks for basic researc

— Constructed 9 new visitor centers and installed 16 ne
museums in parks throughout the country—permitting a bett
program of interpretation.

— Continued efforts to round out a National Park System th
will be adequate in meeting the needs of the Nation—now ar
in the future—with major emphasis and priority on Secr
tary Udall's campaign to preserve some of America's few remai
ing undeveloped natural areas along seashores, lakeshores, ar
free-flowing streams.

— Was tremendously encouraged by President Kennedy
special message on conservation urging the Congress to tal
"favorable action on legislation to create Point Reyes Nation
Seashore in California; Great Basin National Park in Nevad
Ozark Rivers National Monument in Missouri; Sagamore H
National Historic Site in New York; Canyonlands Nation
Park in Utah; Sleeping Bear Dunes National Lakeshore
Michigan; Prairie National Park in Kansas; Padre Island Nation
Seashore in Texas; a National Lakeshore Area in Northe
Indiana; and Ice Age National Scientific Reserve, Wisconsin

— Worked with the Department's other agencies in support
the broad principles of wilderness legislation now before t
Congress.

— Cooperated in advanced planning in anticipation of t
passage of youth employment legislation which would establi
a Youth Conservation Corps designed to offer outdoor emplo
ment in the Nation's parks, forests, and other public lan

— Stepped up its Mission 66 park improvement program.

— Completed a 5-year survey of existing and potential par
and related types of recreation areas. In a State-by-State inves
gation conducted in cooperation with the States, 4,800 existi
and 2,800 potential parks and recreation areas were identifie
These findings were turned over to the Department's Bureau
Outdoor Recreation.

— Increased the use of helicopters to provide better admin
tration, maintenance and protection, especially in mountain
and otherwise inaccessible back-country areas where this type
equipment offers the only fast and reliable methods for emerger

rescue missions, combating forest fires and other forestry work such as control of insect infestation and disease.

— Participated in the Federal and State aerial reconnaissance of storm damage in six States following the disastrous storm of March 6 and 7, 1962, along the Atlantic coast. Shore damage along the barrier beaches was particularly severe at shorefront developments of Atlantic seashore resorts. The Service published a report which explored the question of dedicating shoreline portions of barrier beaches to public use and recommended various means for prevention of the recurrence of such devastation to private property along barrier beaches in the future.

— Welcomed the addition of more women to the uniformed staff of the National Park System as interpretive specialists.

— Cosponsored the First World Conference on National Parks, Seattle, Wash., June 30–July 7, 1962, in cooperation with the International Union for the Conservation of Nature and Natural Resources (IUCN), the Natural Resources Council of America, and other United Nations organizations and Federal agencies. Representatives from 63 foreign countries were guests of the National Park Service at Mount Rainier, Olympic, Yellowstone, and Grand Teton National Parks.

— Placed special emphasis during the year on interpretive work in Civil War areas of the National Park System to meet the impact of increased visits engendered by Civil War centennial observances sponsored by State and local organizations. Many special exhibits were prepared in visitor centers of the National Park System, and the Service cooperated in many special commemorative programs such as the reenactment of the Battle of Manassas.

## *Public Affairs*

The National Park System preserves physical evidences of the rowth of a magnificent and fruitful Nation. It is no wonder—as we me increasingly to grips with the pressures of our modern world—at Americans turn to their heritage for a renewal of spiritual strength d pioneering determination.

Today, Americans are crowding the highways and visiting the arks and recreational areas of the country as never before in history. early visits to the national parks have leaped from 22 million only 5 years ago to more than 80 million last year—and the demands of e public for information about the places they visit have increased in e same ratio.

A new emphasis toward meeting the needs of American and foreig friends visiting the national parks is evidenced in the interpretation these areas through audiovisual services, museums, visitor center informative publications, guided trails, and campfire talks.

Emphasis has also been placed on keeping up with the demands f photographic services to supply the requirements of newspaper magazines, television, and other public relations media.

Our responsibility is not only to the millions who visit the park but also to the many more millions who are unable to see the wonde themselves and must rely on the printed word and pictures.

## *Publication and Service Programs*

Emphasis to date in the publications program has been to produ folders on each of the respective areas of the National Park Servic But more and more, Americans are demanding additional informa tional material. In 1962, the Service printed 4,409,000 copies of 16 free informational publications for the various areas, plus 145,00 copies of 5 general free informational publications. The present publ cations program provides approximately one folder for every si visitors.

A Division of Extension Services was established during the year t provide staff guidance and assistance in connection with Service-spo sored special public events, dedications, observances, and meeting as well as Service participation in public meetings sponsored by oth organizations. The Division also provides liaison services with co servation and education groups, universities and schools, and is r sponsible for developing and carrying out public information progran for needed park resources protection measures.

Requests for National Park Service photographs rose 40 percen during the year, mirroring the interest in Secretary Udall's proposa for new areas for the National Park System. More than 10,000 prin of photographs were loaned upon request for use by various inform tion media and in educational programs.

## *Audiovisual*

The trend toward greater use of audiovisual devices in the interpr tive and educational program of the Service accelerated tremendousl Included in the year's accomplishments were:

— the completion of 10 amphitheaters,

— installation of 51 audio stations,

— installation of 17 automatic slide/sound projection systen in visitor centers,

— installation of public announcement systems in four visitor centers,

— addition of 17 cabinet projector installations utilizing captioned slides,

— construction of two automatic electric maps with synchronized sound,

— equipping of two visitor center auditoriums for "live" presentations,

— improvement of the program for five existing installations.

Park interpretation in foreign language continued. A captioned ide presentation in the Spanish language was installed alongside a milar English version at San Juan National Historic Site, Puerto ico. The enthusiastic reception being given the foreign language pe recordings by foreign visitors to the Liberty Bell in Independence all, Philadelphia, suggests that such service for foreign visitors ould be considered for other areas as well.

## *nternational Cooperation*

A Division of International Cooperation was established in response the growing interest of foreign visitors in America's national parks— idenced, during the year, by 2,100 letters of inquiry from abroad d by more than a thousand foreign visitors who were received by or d made personal contact with various staff members of the National rk Service.

In cooperation with the International Union for the Conservation Nature and Natural Resources (IUCN), the Natural Resources ouncil of America, and other United Nations organizations and Fed- al agencies, the National Park Service cosponsored the First World onference on National Parks held in Seattle, Wash., June 30–July 7 1962. The meeting, which had as its theme, "National Parks Are International Significance," was attended by more than 300 pro- ssional park people representing some 63 nations throughout the orld.

The basic purpose of the meeting was to further international ordination of world conservation efforts and to encourage further e establishment of new parks and reserves throughout the world.

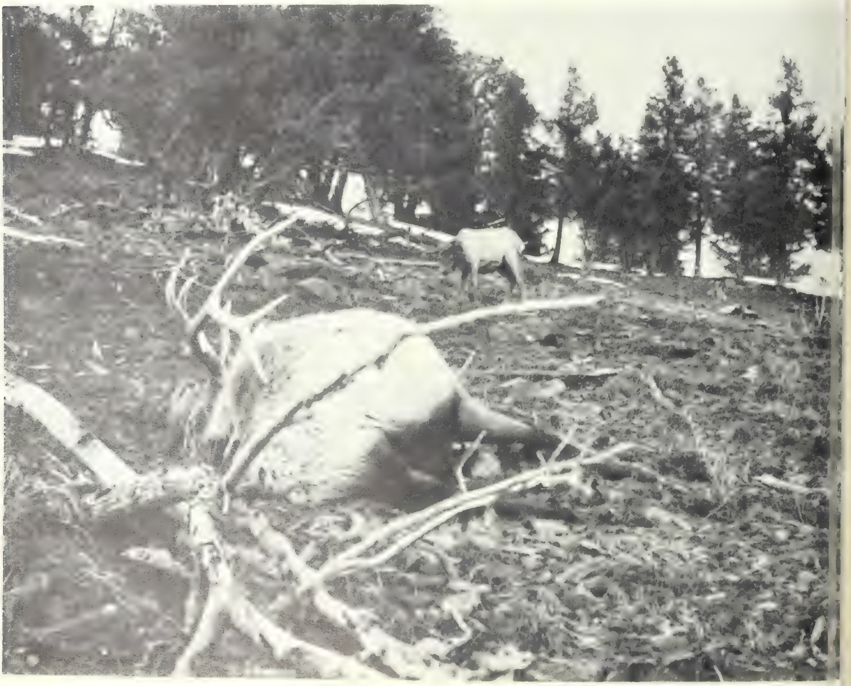
## *Conservation, Interpretation, and Use*

The Service reorganization during the fiscal year brought about gathering of staff divisions concerned primarily with actual park erational activities into a single organizational group under the supervision of Assistant Director of Conservation, Interpretation, an Use. This brought into close association the interrelated function of maintenance, protection, interpretation, visitor use, research, an resource management.

## *Conservation Activities*

A major objective common to most legislation related to th National Park Service places emphasis on preservation from injur and spoliation; conserving the scenery and the natural and histori objects and the wildlife therein for the benefit and enjoyment of th people now and in the future.

Conserving these values and assuring the welfare of park visito required positive protection and carefully regulated use.



*This bull elk died from starvation in Yellowstone National Park. T calf in the background is only hours away from death. Overpopulation elk in the park destroyed the vegetative cover and opened the range to hea erosion. Quick action in reducing elk populations strengthened the he and protected park values.*

## Forests, Soils and Water

Forest fire control efforts reached an alltime high in fiscal year 1962. Alert and trained fire crews and the expanded use of aircraft achieved early control of many fires under hazardous conditions. In the irst half of 1962 drought conditions prevailed in the Southeast. Halfway through its fire season by the end of fiscal year 1962, Everglades National Park had 20 fires, almost double the 10-year average of 11 fires. The Shark Valley fire in Everglades, largest fire in Service history and originating outside the park, burned from May 15 to June 20, 1962, over an area of 184,544 acres—77,664 acres of this was parkland. Major control projects were conducted to combat outbreaks of western pine beetles in Lassen Volcanic, Yosemite, Sequoia, and Kings Canyon; mountain pine beetles in Grand Teton; lodgepole pine needle miner in Yosemite; and gypsy moth in Acadia. Programs for control of white pine blister rust through eradication of the alternate host and the use of antibiotics were continued in 10 parks.

Soil and water conservation measures to restore deteriorated lands were carried out in 20 parks. Management controls were increased to prevent destruction of fragile meadows and vegetative cover types in the high mountains. Range grazing was reduced by 800 animal unit months in the western parks. An AUM (animal unit month) is based on the amount of food (grazing) required to feed one cow or five sheep for 1 month in a particular location, which may vary in carrying capacity, and which, in turn, depends upon climate, soil, and other growing conditions. The total grazing in 18 parks was 85,342 AUM's. Pasturing to maintain scenes in historical parks required 24,209 AUM's.

## Wildlife

There are very few places in the world today other than in national parks where opportunities are available for the public to observe and photograph wildlife under natural conditions. To insure that public enjoyment continues, wildlife management programs are directed at attaining an optimum relationship between all animals consistent with the native flora and in harmony with the conservation of other park values.

Increased bear-management programs this year resulted in a significant reduction of personal injuries and property damage to the visitors. Studies of both grizzly and black bears continued in Yellowstone.

Studies at Grand Teton National Park resulted in recommendations for an elk-management program in portions of that park. Public hunters were deputized to participate in the 1961 program under the

*Wildlife management programs of the National Park Service are directe at attaining an optimum relationship between all animals consistent with th native flora and in harmony with the conservation of other park feature In Everglades National Park, Fla., above, one can see and photograp alligators in their natural habitat.*

provisions of Public Law 787 and removed 278 elk. Cooperative el studies with State and other Federal agencies were developed i Rocky Mountain and Yellowstone National Parks.

Other elk-management programs were conducted in Yellowstone, Glacier, and Rocky Mountain. The outstanding management program for the year was the successful removal of 4,555 elk from th northern Yellowstone elk herd by park rangers. The overpopulatio of elk had already driven out two other species, the beaver and th whitetailed deer.

Acadia, Grand Canyon, Mammoth Cave, and Sequoia and King Canyon carried on limited deer-management programs. Wind Cav Yellowstone, and Grand Teton disposed of 237 surplus buffal Death Valley, Lake Mead, Great Smoky Mountains, and Hawai Volcanoes conducted management programs directed at control feral burros, pigs, goats, and boars.

Fishery studies were carried on in cooperation with the Department's Fish and Wildlife Service in Yellowstone, Rocky Mountain, Mount Rainier, Olympic, and Isle Royale. Seventeen areas carried on stocking programs.

## Interpretation Activities

The values and purposes of the national parks were explained to an increasing number of visitors by the addition of new visitor centers, roadside and trailside signs and facilities, publications, and personnel.

In recognition of an obligation to provide equal opportunities for women, the Service welcomed the addition of more women this year to the uniformed staff of the National Park System as interpretive specialists.

A new venture began with authorization of sound and light programs for Independence Hall in Philadelphia and for Castillo de San Marcos National Monument in St. Augustine, Fla. Modeled after the spectacular night programs presented first at the Castle of Chambord and Palace of Versailles in France and now widely given throughout Europe, they offer a dramatic presentation of history, using controlled light and recorded stereophonic sounds, narrative, and dialog. The first such program in this country began at Independence Hall on July 4, 1962, followed by that at the Castillo later in the summer.

## Visitor Centers

Nine new visitor centers were opened: Big Bend National Park, Tex.; Petrified Forest National Monument, Ariz.; Great Sand Dunes National Monument, Colo.; Homestead National Monument, Nebr.; Fort Donelson National Military Park, Tenn.; Gettysburg National Military Park, Pa.; Saratoga National Historical Park, N.Y.; Fort Vancouver National Historic Site, Wash.; and Natchez Trace Parkway, Mississippi, Tennessee, and Alabama.

## Exhibit Installation

Sixteen parks installed museums—seven in new visitor centers, five in enlarged or remodeled ones, and four in existing buildings. More than 300 exhibits were installed in visitor center museums from coast to coast to help interpret the varied stories our parks have to tell.

An example is the remodeled center in Fredericksburg, Va., which shows how a Confederate officer lived during a hard winter of the Civil War, complete with folding camp cot, writing desk and other paraphernalia of the period. In the new visitor center at Great

Sand Dunes, an exhibit uses animated diagrams to show how san moves to form the dunes.

Another, at the Homestead center, features a unique cold-rolle mangle which used large rocks to provide the weight needed for th pioneer mother to iron the family wash. A slide-sound prograı accompanies the machine to explain how she used it. Eight scal dioramas, from Saratoga, N.Y., to Fort Vancouver, Wash., captur some of the great moments in our history.

The Service participated in the White House Historical Associatio program by working with the Smithsonian to provide exhibits on th development of the Executive Mansion.

## *Museum Collections*

Parks have added many fine Museum specimens. These include rare German astrolobe by Johann Krabbe, dated 1582, donated to th collections of Fort Caroline, Fla.; an outstanding group of Spanis arms added to the holdings of Tumacacori, Ariz.; military uniforms an flags from the Spanish Army Museum for Castillo de San Marco Fla.; and two Congressional Medals of Honor for display at th Chancellorsville and Stones River, Tenn., centers.

The Service has continued its program of preserving specimen paintings, and furnishings in the collections of the parks. It complete one of the largest such projects undertaken, the painstaking restoratio and rehanging of the famed Gettysburg Cyclorama in the new visitc center. The magnificent painting, 353 feet in circumference and 2 feet high, serves as the centerpiece for an inspiring program, supporte by sound effects and an inspirational narrative.

## *Roadside and Trailside Interpretation*

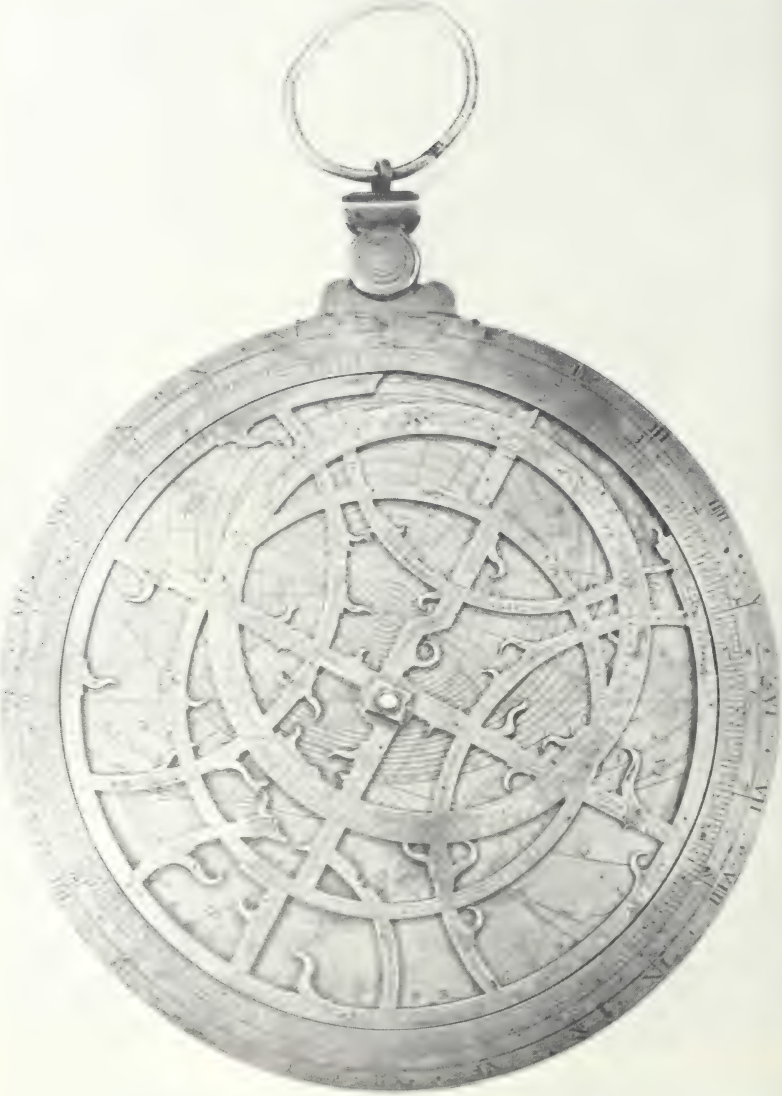
Roadside interpretive facilities were developed or substantiall improved in 17 scenic-scientific parks and in 16 historic ones. Th installation of interpretive signs, markers, and trails along the Tiog Road in Yosemite typifies effective "self-service" interpretation alor park roads.

Coordinated planning with Service architects and landscape arch-tects has produced the Lee's Hill Shelter panels, Fredericksburg, Va and the High Water Mark Tour exhibits, Gettysburg, Pa. Greate use of more durable materials, like metal photos, brought encouragin results in on-site exhibits.

While self-service interpretation was improved and expanded on wide front, the program of conducted trips and talks was also increase In Yosemite National Park, naturalist-led High Sierra 7-day hike were resumed after 20 years. Permanent and seasonal interpreti

*S cretary of the Interior Stewart L. Udall examines a statue of Theodore Roosevelt with Oscar Strauss, president of the Theodore Roosevelt Association, a the Roosevelt Birthplace, New York City. The building is an area r commended as a national historic site.*

s affs were enlarged and 13 new amphitheaters and campfire circles were completed, resulting in an expansion of evening programs in parks where visitors stay overnight.



*An astrolobe made, signed, and dated by Johann Krabbe in 1582, was recent acquired by the National Park Service. An unusually fine specimen contai ing much astronomical detail, it is believed to be the only 16th century astr lobe in the Western Hemisphere heavy enough to have been used for navig tion. Purchased and donated anonymously, it will be exhibited at Fo Caroline National Memorial, Fla.*

## *Historic Houses*

The House of Representatives in Congress Hall, Independence National Historical Park, Philadelphia, has been refurnished to the period of the 1790's when it resounded with the debates of legislators of a young nation. A Federal eagle, painted on the ceiling of the Senate Chamber in Congress Hall, painstakingly removed last year, has been restored and replaced.

The restoration program of Fort Laramie, Wyo., has continued with the refurnishing of the Sutler's Store and a second officers' quarters.

## *Cooperating Associations*

Some 53 nonprofit cooperating associations contributed $169,941 for aid to the National Park Service for research, equipment, books, and materials used in the interpretive program. These associations produced 29 new publications for sale in the areas. A full-color publication, "Jamestown to Yorktown From Settlement to Nationhood," has won two national awards. "History of the United States Flag" has received national recognition. Both were produced by the Eastern National Park & Monument Association. "Mammals of the Southwest Mountains and Mesas," was published by Southwestern Monuments Association.

## *Research Efforts*

Historical research studies, 46 in all, were completed during 1962 by Service historians. "Puerto Rico and the Elizabethan Age: An Historical Analysis of the Attack by the Earl of Cumberland Against the Island of Puerto Rico," expanded our knowledge of San Juan National Historic Site. Other notable studies covered such subjects as restoration of the Russian Blockhouse at Sitka, Alaska; General Andrew Jackson's "Mud Rampart" defense line at the Battle of New Orleans. Twenty-two studies relating to the Civil War were completed during its second centennial year and included a study of "Clara Barton at Antietam."

Two historians were sent to Spain during the year to procure historical data from Spanish archival sources and to purchase, in part with donated funds, historic objects and specimens needed for museum purposes at San Juan, Castillo de San Marcos, and Fort Raleigh.

## *Archeology*

Archeological research was carried on in 31 areas of the system, the largest program to date. Major projects were initiated at Cape

Cod, Chesapeake and Ohio Canal, and others continued at Acadi Grand Portage, Independence, and Hopewell Village. Historic archeology conducted in seven areas supplemented and verifie historical records. Historic objects were found in some primari prehistoric sites, as at Ocmulgee, filling in knowledge of early Europe contact with the Indians. At Isle Royale, a survey is providing in portant data on aboriginal and early historic sites.

The Service has been vigilant to prevent destruction of archeologic remains that might be lost through construction in areas of the syster During the year a major salvage project was initiated at Ocmulg where Interstate Highway 16 will cross the monument. It w financed by the State of Georgia at a cost of $155,000, reimbursed b the Bureau of Public Roads.

The Wetherill Mesa project passed the halfway point. Mine sit which present a thorough coverage of the Indians who lived at Me Verde are being excavated. For the fourth year, the National Ge

*Archeologists salvage prehistoric artifacts and scientific information from 5,000-year-old Indian campsite near the new Red Willow Dam in Nebrask while cooperative construction crews work around them to shape the ne reservoir basin.*

graphic Society donated $50,000. It is one of the major endeavors of New World archeology, matching in scope, duration, and financial support the most ambitious past undertakings.

## *Salvage Archeology in River Basins*

The Service continued its extensive salvage program in reservoir areas with the cooperation of Federal, State, and local organizations. There were 62 salvage projects in 35 States with 34 cooperating institutions. The Smithsonian Institution had 3 field parties in the Missouri River basin in the fall, and 16–18 work crews for the season beginning June 1962.

The University of Utah, Museum of Northern Arizona, University of Colorado, and Museum of New Mexico cooperated with the Service on the Upper Colorado River project, conducting surveys and excavations in Glen Canyon, Fontenelle, Flaming Gorge, and Navajo Reservoirs, and the Blue Mesa unit of the Curecanti project.

The University of Texas excavated in Amistad (Diablo) and McGee Bend Reservoirs and surveyed Toledo Bend, Columbus Bend, and Livingstone. Work continued at John Day Reservoir by the University of Oregon, and at Walter F. George Reservoir by the Universities of Georgia and Alabama.

## *Natural History*

Secretary Udall secured the assistance of the National Academy of Sciences in planning and further broadening the National Park Service's proposed comprehensive research program. A new comprehensive natural history research program for the national parks—endorsed by the Secretary's Advisory Board on National Parks, Historic Sites, Buildings, and Monuments—was launched, under which the Service considers research as a comprehensive system-oriented program rather than a piecemeal, problem-oriented series of projects. Since knowledge obtained through research is equally important to protection, development, park use, wildlife management, and interpretation, the new program will include periodic reappraisals of ecological conditions to determine whether changes are needed in management practices, to identify and correct ecological damage before it can reach an irreversible stage, and to ascertain the need for additional specific research.

To assist in carrying our these objectives, the Academy, in cooperation with the Department of the Interior, selected an advisory committee of the country's leading scientists.

The biological research program produced two outstanding books "A Naturalist in Alaska" and "The Bighorn of Death Valley." The latter publication is a revival of the National Park Service Faun Series on natural history research.

Outstanding progress was made in research on the interrelationshi of wolf, beaver, and moose at Isle Royale. Cooperative research i the Yellowstone Lake fisheries and marine research in the Virgi Islands were completed.

An analysis of water-supply needs for preserving the ecology Everglades National Park was undertaken by the University Miami, which also continued its research into the dependence of commercial fish populations on park waters. Another research projec showed that tree invasions of meadows on the floor of Yosemite Valle are natural, unlike forest invasions at higher altitudes which othe research has shown to be caused by human interference.

Progress continued on studies of the survival and natural propagation requirements of the Giant Sequoia and on the ecological requirements of the rare Kaibab squirrel in Grand Canyon. In Gran Teton and Yellowstone, in cooperation with the Montana Cooperativ Wildlife Research Unit, transistorized radio transmission sets wer attached by collars to grizzly bears to trace their activities.

Extensive geological research was accomplished in the nation parks. Studies of hydrothermal features and phenomena in Yellowstone, which were stepped up following the Hebgen Earthquake 1959, were continued in cooperation with the Department's Geologic Survey.

Excellent progress was made on continuing or recurring project including glacial studies in Glacier, Mount Rainier, Olympic an Sequoia and Kings Canyon; volcanological investigations in Hawa volcanoes; and studies of geology and ecology at Great Sand Dune

The Department has approved a program of identification, evaluation, selection and registration of nationally significant geologic an ecologic sites.

## *Ruins Stabilization*

Ruins stabilization crews from the Southwest Archeological Cente worked in eight sites. The Wetherill Mesa project did stabilizatio in conjunction with excavation. Other stabilization at Mesa Verd included the spectacular pinning of a free-standing arch to the cli above Spruce Tree House, and the digging of a 300-foot tunnel unde Cliff Palace to drain excessive moisture.

## *Historic Sites, Buildings, and Landmarks*

Substantial progress was made in the National Survey of Histori Sites and Buildings, which completed the following studies: "Politic

*A National Park Service archeologist views a mass display of prehistoric Indian pottery recovered from the Wetherill Mesa excavations at Mesa Verde National Park. Study and analysis of these artifacts will shed new light on the life of Indians who made them.*

and Military Affairs, 1830–1860", "Transportation and Communication", and "Dutch and Swedish Exploration and Settlement." To date, 23 studies have been completed, leaving 17 to be done. Of these, nine are underway. A volume entitled "Road to Revolution: Virginia's Rebels from Bacon to Jefferson, 1676–1776" was published.

By the end of the fiscal year, 311 sites were classified as possessing exceptional value and eligible for registered national historic landmark status. Under the registry, 179 certificates and 77 bronze plaques have been issued. The landmark program has been enthusiastically received by the public, with formal ceremonies being held in connection with the majority of certificate and plaque presentations. In a number of cases, such as Graham Cave in Missouri and Fort Robinson, Nebr., landmark status has expedited or encouraged acquisition of sites by States or preservation organizations for public use. This is one of the purposes of the registry.

## *Visitor Use*

The National Park Service is emphasizing the need to protect park values rather than relying only on the rigid enforcement of laws.

*Civil War reenactments and exhibits were part of the interpretive work in th Civil War areas of the Park Service during the first year of the Civil Wa centennial observances. The first reenactment took place at Manassa National Battlefield Park, Va., on July 21, 1961.*

This emphasis contributes to visitor enjoyment and accomplishes th protective function in a manner that creates a "park atmosphere. No one likes to go to an overregulated park. However, protectio against vandalism and other violations which damage the parks fo future users is always necessary.

The numerous facets of ranger activity assignments require specialized emphasis on such subjects as visitor protection, forest an structural fire control, safety of park visitors and park employees, search-and-rescue techniques, wildlife management, law enforcement, and mountaineering.

## *Training*

Training of ranger services and supporting personnel at all level in the skills of park and visitor protection, wildlife management, an emergency operations were expanded and involved more than 2,00 individuals.

*New visitor centers were constructed in nine National Park Service areas. One of these was dedicated at Homestead National Monument, Nebr., on June 10, 1962.*

The training center at Yosemite provides two 3-month courses ach year for newly appointed uniformed employees. The curriculum ncludes Service history, policies, objectives, organization, and field operations. Initiated in 1957, it has graduated 254. In 1963, the raining center will move to a special facility now under construction t Grand Canyon.

## *Cooperation*

Cooperation with Federal and other organizations has been expanded in relation to park use. Primarily concerned were activities elating to water recreation, law enforcement, regulations, mounaineering, winter use, camping, conservation and preservation of esources. Two park rangers toured seven Europlan countries as part of a team in promoting the "Visit USA" program. Millions of Europeans learned something of the significance of the National Park System and were invited to enjoy with the people of the United States these areas of national and international interest.

Ranger services in cooperation with other Federal bureaus organized, coordinated, and conducted a pilot field program for 10 African college students. These students, potential leaders of new African nations, were acquainted with the principles of resource conservation and management as practiced by the Department.

*The National Park System preserves outstanding scenic, scientific, and hi- toric areas of the Nation "for the present and future generations." Olymp National Park's Delabarre Glacier, above, is an outstanding example preservation of a scenic area.*

## *Concessions Activities*

Concessioners in several areas invested substantial amounts i expanding and improving their overnight accommodations an rehabilitating existing facilities. The most important improvemen ere made by the concessioners as follows: South Rim of Grand anyon, $372,000; Sequoia and Kings Canyon, $101,000; Shenandoah, 44,000; and Yosemite, $351,000. Projects by the concessioners are ther under way or being planned in Big Bend, Everglades, Mammoth ave, and Olympic National Parks, on the Blue Ridge Parkway, and Lake Mead National Recreation Area.

The District of Columbia Stadium, on lands administered by the ational Park Service, was dedicated and placed in use during the ar. The stadium is managed by the District of Columbia Armory oard under contract with the Department of the Interior.

Concession facilities at Cape Hatteras, which were demolished by lantic tidal storms, have been reconstructed and restored to rvice.

National Park Concessions, Inc., was granted a new 20-year conact for continued operations in Mammoth Cave, Big Bend, Isle oyale, and Olympic National Parks, and the Blue Ridge Parkway. nder the terms of this contract, the company will invest $3 million new and improved facilities at these areas. In addition, contracts re entered into with concessioners at Fort Sumter, Glacier, and ke Mead. Three prospectuses were issued inviting offers in conction with concessions at Fort Jefferson National Monument, and ot Springs and Great Smoky Mountains National Parks.

## *perations and Maintenance*

New maintenance techniques have been employed. A new type tary snowplow at Yellowstone, in its first year of operation, gave a ghly satisfactory performance. New mobile highway lane stripers areas with highspeed roadways, have reduced costs and discomfort. azardous trees are being removed in public areas in Yosemite, Banlier, Sequoia, and park areas in our Nation's Capital. By using -to-date research and management techniques, costs are reduced d the esthetic enjoyment of the visitor is increased.

To accommodate the campers, hikers, and wilderness enthusiasts, back-country cleanup program is underway at Sequoia, and lakeore cleanup is progressing nicely at Coulee Dam.

## *afety*

Calendar year 1961 was one of the most successful on record both accident reduction and program effort. Two outstanding accomishments were: First, the great reduction in accidental deaths to ational Park Service, concessioner and contractor personnel working the parks. The past average of 13 workers (including 3 Service ployees) killed by accidents on the job each year was reduced to a

*Picnicking and camping are pleasant interludes for travelers on parkwa administered by the Park Service. Natchez Trace Parkway, Tenn.-Ala Miss., contains 450 miles of roads and offers many picnicking and campi areas.*

total of 3 fatal accidents in 1962, 2 of these being contractor employe and 1 a Service employee. Prior to the one fatal accident, the Servi had compiled a record of 22 consecutive months without a fat accident to a Service employee. Second, the direct dollar loss cost to the Service from accidents was reduced $283,000, or a roximately a 61-percent improvement as compared to the annual verage loss total of previous years.

## *Park and Recreation Planning*

The National Park Service's park-planning program is designed to pand the National Park system by selecting for preservation—hile still available—those outstanding scenic, scientific, and historic eas of the Nation which are of national significance so that future rk needs may be fulfilled. Although the Department's Bureau of utdoor Recreation is taking over the principal recreation planning r the Nation, the National Park Service still requires its own plan- ng operation for areas which it administers or plans to administer.

This program made significant progress during the year. Field vestigations of approximately 60 areas throughout the country—hich had been suggested for possible national park, national his- ric site, or national recreation area status—were conducted during e year. Comprehensive planning studies—such as specific area udies, economic studies, or land-use studies—were made of more an 20 areas to determine their national significance and their suit- ility and feasibility for inclusion in the National Park System. mong these were Florissent Fossil Beds, Colo.; Poverty Point, La.; int-Gaudens, N.H.; Big Horn Canyon, Mont.-Wyo.; Pecos, N. ex.; and Baltimore & Ohio Railroad Museum, Maryland.

Illustrated brochures—printed with private donations—were issued is year to describe the proposed Canyonlands National Park, tah; Ice Age National Scientific Reserve, Wis.; Prairie National Park ans.; and Sleeping Bear National Seashore, Mich.

The Department is supporting legislation to authorize the estab- hment of the following areas: Chesapeake & Ohio Canal National istorical Park, Md.; Fort Bowie National Historic Site, Ariz.; ount Vernon-Woodlawn Extension, George Washington Memorial rkway, Va,; Great Falls Park (part of National Capital Parks Sys- m), Va.; and Hubbell Trading Post National Historic Site, Ariz. he Department also endorsed a study of a proposed Allegheny Park- ay which would extend from Hagerstown, Md. to Cumberland Gap ational Historical Park. In addition to the above-named areas, gislation was introduced in the 87th Congress to authorize the es- blishment of the following areas: Boston National Historic Sites, ass.; Fort Larned National Historic Site, Kans.; Golden Spike ational Monument, Utah; Oregon Dunes National Seashore Recre- ion Area, Oreg.; Pictured Rocks National Lakeshore, Mich.; Tocks land National Recreation Area, Pa.-N. J.; Valle Grande National rk, N. Mex.; and Whiskeytown National Recreation Area, Calif.

*Buck Island Reef National Monument near St. Croix, V.I., was one of t three new areas added to the National Park System during fiscal 196 This area saves delicate coral formations and marine life from dangers commercial fishing, spear fishing, and shell and coral collecting activiti*

## *Areas Authorized or Established*

Three new areas were established and six areas authorized f addition to the National Park System during the year.

A unique area, the City of Refuge National Historical Park Hawaii, was established on July 1, 1961, to commemorate the sacr grounds where—until 1819—the vanquished Hawaiian warrio the oppressed, and the taboo breakers could find protection and haven.

One of the finest marine gardens in the Caribbean is now protect in the Buck Island Reef National Monument, near St. Croix, V. which was established by Presidential proclamation on December 2 1961.

On August 7, 1961, Congress authorized the establishment of Ca Cod National Seashore. This act was a landmark in park legislati since it authorized $16 million for land acquisition—the first ti ongress has authorized the appropriation of funds to acquire lands itially for a major scenic area of the National Park System.

Five new historical areas were authorized by Congress this year. ort Davis National Historic Site in Texas, the site of a famous ontier fort, was authorized on September 8, 1961. The Fort Smith ational Historic Site in Arkansas, authorized by the act of Sep- mber 13, 1961, will commemorate the two successive forts located this site to maintain peace among the several Indian tribes of is region from 1817 to 1871.

Piscataway Park, planned to be a part of the National Capital rk System, will preserve the Maryland shoreline of the Potomac ver which contains the historic vista and scenic environs of Mount rnon, the George Washington Memorial Parkway and Fort ashington. This area was authorized for acquisition by the act October 4, 1961.

Another area honoring Abraham Lincoln, the Lincoln Boyhood ational Memorial in Indiana, was authorized on February 19, 1962. so, Alexander Hamilton will be honored by the preservation of his me in New York City. Authorized by the act of April 27, 1962, is building will be moved to the campus of the City College of ew York and be designated Hamilton Grange National Memorial. ch of these five areas will be officially established when the Federal overnment has acquired the required lands.

## *oundary Adjustments*

Legislation has been enacted during this year which authorized ditions of lands at Cumberland Gap National Historical Park, rt Raleigh National Historic Site, and Lassen Volcanic National rk; additions and deletions at Wupatki National Monument; and th boundary revisions and name changes for Fort Necessity and pelo National Battlefields.

By Presidential proclamation, 14,720 acres of public lands were ded to Saguaro National Monument, and 375 acres were added to la Cliff Dwellings National Monument.

Legislation also authorized the disestablishment of the Ackia ttleground and Meriwether Lewis National Monuments and their lusion in the Natchez Trace Parkway. These areas are now known the Chickasaw and the Meriwether Lewis units of the parkway.

## *anning for Nonurban Parks and Recreation Areas*

A 5-year survey was completed on existing and potential parks d related types of recreation areas to meet future needs. The vey consisted of a State-by-State investigation, conducted in cooperation with the States, and identified about 4,800 existing a 2,800 potential parks and recreation areas which could help to m present and future outdoor recreation needs. Such cooperat nationwide planning will hereafter be the responsibility of t Department's Bureau of Outdoor Recreation.

## *Economic Research*

Economic research during the year focused on measurement of t impact of proposed parks on the basic economic structure of an a and on the comparative effects on the economy and on the gene welfare if natural resources are used for recreation development for alternative uses.

A study was made by the University of Utah for the Service t determine the economic impact which might be expected to res from the establishment of the proposed Canyonlands Natio Park and to investigate the probable future growth of visits to t existing concentration of parks and monuments located within t region of the proposed park. A study was completed also on t economic feasibility of the proposed Sleeping Bear National Seasho

A study of the recreation resources of northeastern Vermont w initiated to determine the economic feasibility of developing t recreation potential of that area. A prospectus for the study w developed and a contract negotiated with the University of Vermo

## *Urban Open Space*

The Service assisted in the preparation of a joint report by t Department of the Interior and the Housing and Home Fina Agency on a long-range program and policy for open space and orde development in urban areas. The Service also maintained liais with the Housing and Home Finance Agency on the program grants to States and local public bodies for the acquisition of op space land in urban areas, established under the Housing Act of 19

## *Special Studies*

A 3-year study of reservoir recreation potentialities in the Potom River basin was completed, with funds provided by the Corps Engineers. Work was undertaken, also at the request of the Co of Engineers, on a 3-year study of the park and recreation area tential of proposed reservoirs in the Ohio River basin.

A report on Puerto Rico's recreation resources was completed un contract. Fieldwork was completed on a seashore and park study Hawaii.

Following the disastrous storm of March 6 and 7, 1962, along the tlantic coast, which caused severe damage along the barrier beaches six States, the Service assisted in the organization of a task force of ederal and State agencies to make an aerial reconnaissance of the iorelines of the six States and published a report, "Seashore Preservaon and Recreation Opportunities and Storm Damage." The report :plored the question of dedication of shoreline portions of the barrier ›aches to public use.

### *ooperation With the States*

Advisory assistance was given in 48 States on 771 occasions, an crease of 23 percent over 1961. Of special interest is the increase in e number of requests received for assistance in interpretive planning id requests from Indian tribes for planning recreation developments their lands. In the future, such activities will also be continued by e Department's Bureau of Outdoor Recreation.

***deral and State agencies cooperated in making a storm damage survey mg the Atlantic coast following the disastrous storm of March 6 and 7, 52. Assateague Island, Md., above, was one of the areas where damage the dunes and barriers was severe. Suggestions were advanced for making island a public recreational area.***

"State Park Statistics—1961" shows substantial increases acquisition, development, and use of State parks. Tabulations sho (1) attendance exceeding 273 million, including 23 million overnig visitors; (2) expenditure of $61 million for operation and maintenanc $13 million for land acquisition, and $36 million for improvement (3) revenue from operations of $23 million; and (4) 7,984 year-rou and 10,142 seasonal personnel. Reported also was a total of 2,7 areas embracing almost 6 million acres.

## *Real Property Disposal*

Recommendations were furnished to General Services Administr tion on 28 applications submitted by the States and their politic subdivisions to acquire Federal surplus real properties for public par recreation, and historic monument purposes. The Service has carri compliance responsibility on a total of 232 properties embracing 30,3 acres. Recommendations also were furnished to the Departmen Bureau of Land Management on 78 applications to acquire publi domain lands for similar purposes.

## *Reservoir Planning and Management*

Two important new policies on acquisition of lands and provision recreation facilities on reservoir projects—one issued by the Secreta of the Interior relating to reservoirs constructed by the Departmen Bureau of Reclamation and the other issued jointly by the Secretari of the Interior and Army relating to both Reclamation and Corps Engineers projects. These policies provide for all planning reports include recommendations for Federal acquisition of all lands need in the foreseeable future for recreation purposes and the provision basic recreation facilities required for current needs.

Also of outstanding significance is the new statement "Polici Standards, and Procedures in the Formulation, Evaluation, and R view of Plans for Use and Development of Water and Related La Resources," approved by the President on the recommendations the Secretaries of the Interior, Army, Agriculture, and Health, Ed cation, and Welfare. This provides that recreation will be giv equivalent consideration as a project purpose on all Federal mul purpose water resources projects.

During the year, 90 recreation reports were prepared for the Bure of Reclamation and 38 for the Corps of Engineers and arrangemen were concluded with State and local agencies to manage recreati developments on 7 Reclamation reservoirs. Twenty-one applicati for Federal Power Commission permits and licenses were received a recommendations provided to the Office of the Project Revi Coordinator.

The Service made its experienced park and recreation specialists
ailable to provide advisory and planning assistance to States and
eir political subdivisions taking advantage of the Area Redevelop-
ent Administration program which was authorized by an act of
ongress approved May 1, 1961.

## *Design and Construction*

The construction program was the most intensive of any previous
ar in the National Park Service history. There were 775 new
nstruction projects programed at approximately $63,166,500,
cluding projects for recreational facilities in the Upper Colorado
iver Basin Reservoir areas, not including exhibits, interpretive
vices, rehabilitation projects, and advanced planning which in
emselves amounted to $2 million.

The new projects, plus work carried over from the previous year,
me to 1,667 projects in the active construction program totaling
34,677,747. As of May 1962 these totals, through further program
justments, had increased to 1,740 projects amounting to $135,007,-
9. Of all projects, 26 percent were completed and an additional
percent were under construction. Only 16 percent were not
der construction. To augment professional services provided by
e field design and construction offices, 22 contracts for professional
chitectural and engineering services for approximately $144,150
re awarded. Projects involved were estimated to cost approxi-
ately $7 million.

### *rchitecture*

The Service awarded its biggest contract for the "Gateway Arch,"
630-foot stainless steel arch which will rise on the St. Louis water-
ont at Jefferson National Expansion Memorial. It will be a
minant feature of downtown St. Louis and is scheduled for comple-
on in 1964, the 200th anniversary of St. Louis.

The stately visitor center at Parachute Key, Everglades National
rk, an example of dignified Federal architecture, was completed
ior to the heavy upsurge of winter visitor use. The Rock Creek
rk Nature Center in Washington, D.C., filled a long-felt need and
enjoyed by thousands of visitors in the Nation's Capital.

An unusual architectural design concept, based on the historical
ecedent of the octagonal blockhouse of Revolutionary and post-
evolutionary times, resulted in the pleasant visitor center at Saratoga
ational Military Park.

The Gettysburg Cyclorama and Visitor Center, featuring the
lossal painting of the battle by Pierre Philapoteaux, also provides

a rostrum for important speakers and an auditorium and gather ground for several thousand people, in honor of Lincoln's immor Gettysburg Address.

The faithful restoration of Congress Hall which shows with exac tude the conditions, architecture and decor under which the Fi Continental Congress met adjacent to Independence Hall in Phi delphia is a worthy achievement in the historic buildings program.

## *Engineering*

The Division of Engineering supervised 1,134 projects. A to of 485 minor roads and trails projects were programed in 122 are providing improvement of visitor facilities and extension and enlarg ment of campground and picnic areas. These, plus projects providi public access to newly acquired areas, totaled $22,756,595.

A significant accomplishment was the start of a 20-mile jeep tr at Katmai in Alaska, from Brooks River Camp through a magnifice wilderness to overlook the Valley of 10,000 Smokes. Heavy equ ment and supplies were moved to King Salmon by air across the froz Naknek River to Brooks River Camp. Twenty-three visitor facil projects were constructed on the Blue Ridge Parkway. Reconstru tion of facilities damaged by the hurricane at Cape Hatteras a Everglades and reconstruction of roads and trails damaged duri the 1961 earthquake at Yellowstone were major projects.

Twenty-seven projects were completed to provide commerc power and telephone service including lighting at Mammoth Cave a Carlsbad Caverns and powerlines at Blue Ridge Parkway, F Pulaski, Lake Mead, and Olympic. Five additional radio syste were completed, bringing the total of leased commercial systems to Most notable were the Blue Ridge and Natchez Trace Parkwa systems. The Natchez Trace system employs 10 frequencies a permits instant and constant contact throughout the 450 miles of t Parkway. Special audiovisual equipment designed to provide au matic slide-sound programs was installed in nine park auditoriums a three amphitheaters. Electric maps coordinated with narrated d criptions illustrate troop movements at Horseshoe Bend, Frederic burg, and Spotsylvania.

General utilities and miscellaneous structures such as marin docks, and interpretive facilities were expanded. Water and sev facilities were constructed in 28 States, the District of Columb Puerto Rico, and the Virgin Islands. Three hundred and fifty-n projects such as signs, picnic and camping facilities, and camp circles were constructed in 33 States. One hundred and th camping areas were developed in 51 areas to bring the total sites the system to nearly 22,000.

### andscape Architecture

Greatest emphasis was placed on programs providing additional iles for continuous travel on the national parkways, improved visitor cilities, the study of future parkways, and significant major park ad development across the Nation. For parkway programs, a total ntract authorization for $16 million was distributed among the Blue idge, Colonial, Foothills, George Washington Memorial, Natchez race, and Suitland Parkways. On June 30 there were 37 major ntracts totaling approximately $26,300,000 in process under the ıreau of Public Roads major roads program. These include 52 les of final paving, 69 miles of grading and base course work, 36 idges and grade separation structures, 9 tunnels, and other roadork. Outstanding major park road projects completed included velopments in the East and Far West at a cost of $8.5 million.

### aster Plan Coordination

A Division of Master Plan Coordination provides, for the first time, ntral coordination and direction to the Service-wide program of ıster plan preparation and consists of two major branches, master ın narratives and master plan drawings.

Master plans for the Upper Colorado River Basin Reservoir areas ch as Crawford, Flaming Gorge, Glen Canyon, Navajo, Paonia, and einaker have been prepared. Construction in some of these areas s already been undertaken or scheduled.

## Lands

Recognizing the pressing National Park System land requirements conservation, development, and opening of additional areas to the siting public and to establish vital new parks, the Congress approiated a total of $7,600,000 for the purchase of lands for fiscal 1962. ıe 22,950,000 acres of land and water comprising the areas of the ıtional Park System is less than 1 percent of the total area of the ıited States. They include non-Federal lands totaling 433,000 res. Although less than 2 percent of the gross acreage, these inldings constitute a serious administrative handicap out of all prortion relative to the 22,517,000 acres of Federal lands now in the ıtional Park System. Purchase of 14,000 acres in both newly thorized areas and in established areas, including Civil War sites, s in process.

The newly authorized areas are Bent's Old Fort National Histo Site, Colo., and Minute Man National Historical Park and Cape C National Seashore, both in Massachusetts. Negotiations are p gressing in these three areas for the purchase of properties.

Land-purchase programs are active in 21 established areas, incl ing five Civil War sites, with realty acquisitions varying in acrea and description from a 0.081-acre extensively improved histori parcel of city land to a 1,200-acre tract of scenic semiarid grazing la Other scheduled purchases are homesite subdivisions in stands beautiful trees, rights-of-way for road construction, sites for visit centers, mining claims, structures of historical and architectu significance, blighted city property which is a fire hazard threat nearby historical buildings, sites of Civil War events and lands enhance vistas.

Various public agencies, private organizations, and individuals d ing the year have donated to the United States real property with nine areas of the system for the use of all the people of the Unit States. Land exchanges in six areas brought significant properti into Federal ownership.

Other Federal bureaus transferred scenic and important lands the custody and jurisdiction of the National Park Service in six its areas.

## *Water Rights*

A major challenge has developed in the struggle to preserve t ecology of Everglades National Park as an asset in the growth southern Florida. Approximately 90 percent of its fresh water sources originate at precipitation on the park and 10 percent on t adjacent Central and Southern Florida Flood Control District. Th 10 percent, with its seasonal and annual variation in quantity, i essential to maintain a balanced subtropical ecology on the seasonal inundated land area; and in the brackish water of its bays and est aries, which are a vital element in the life cycle of the Tortugas shri and other sports and commercial fish on which established industri have grown throughout the State. It is also needed for the increa ing population and other industries of metropolitan Dade Count The problem is to determine the portion of the 10 percent which m be spared for the other municipal and industrial purposes witho jeopardizing the ecology, and to cooperate in planning the cent and southern Florida flood control project throughout the Great Everglades drainage including the Kissimmee River to provide flo control, drainage, and water storage and allocation for all purpos

# *Park Attendance*

Fiscal year 1962 brought 82,300,000 visits to the national parks and lated areas; an increase of 8.6 percent over fiscal year 1961. Early the year, total travel moved firmly across the long-run 1947–62 rmal growth curve, thus indicating a trend toward a heavier-than-rmal public use of the parks throughout calendar year 1962 and obably into 1963, after which a relative and modest softening of is curve may reasonably be expected to occur.

***er 82,300,000 visits were recorded in areas of the National Park System ring fiscal 1962, for an 8.6-percent increase over the previous year. Old ithful, above, continues to be a main attraction at Yellowstone National rk.***

Turning to calendar year comparison, 1961 growth in total visits er 1960 was not uniform throughout the Nation. Parks in Southstern United States rose 12 percent; the Pacific coast and the tional Capital area increased 9 percent; Northeast was up 4 percent; ile travel to parks in the Rocky Mountains, the Plains, and the uthwest produced changes of less than 1 percent.

amping in the national parks was up 4.4 percent from 1960 with otal of 5,051,000 camper days. None of the increase occurred in t camping—all of it was in trailer camping which increased 17 rcent—so as to amount to almost 30 percent of all camping in the rks. The expansion of camping facilities reduced the total proportion of public camping in irregular or overcapacity conditions to percent from the 14 percent recorded in 1960.

## *Budget and Finance*

Continued improvement in the Service's capacity and capabili for meeting its responsibilities was realized through 1962 fiscal y appropriation increases. In addition to increases in its regu appropriations, funds were provided the Service in the Departmen Bureau of Reclamation's appropriation to initiate construction recreation facilities in the Upper Colorado River Basin Reserv area sites as authorized by the Colorado River Storage Project A The following is a comparision of the 1962 appropriations with th for 1961:

| Appropriation item | 1961 fiscal year | 1962 fiscal year | Increas |
|---|---|---|---|
| Service appropriations: | | | |
| Management and protection | $20,509,000 | $22,586,500 | $2,077 |
| Maintenance and rehabilitation of physical facilities | 15,800,000 | 18,269,000 | 2,469 |
| General administrative expenses | 1,581,000 | 1,581,000 | ---------- |
| Construction | 21,528,000 | 36,726,000 | 15,198 |
| Construction (liquidation of contract authorization) | 30,000,000 | 30,000,000 | ---------- |
| Total cash appropriations | 89,418,000 | 109,162,500 | 19,744 |
| Construction (amount by which roads and trails and parkways contract authorization exceeded cash appropriation) | 4,000,000 | 4,000,000 | ---------- |
| Total new obligational authority Service appropriations | 93,418,000 | 113,162,500 | 19,744 |
| Appropriation transfers from other agencies | 5,342,000 | 7,850,400 | 2,508 |
| Grand total, new obligational authority | 98,760,000 | 121,012,900 | 22,25 |

Of the total increases reflected in the foregoing, $4,894,000 was continuation of construction at Jefferson National Expansion Men rial, $1 million to commence a program for construction of facilit in the New York City Shrines areas, $2,270,500 for construction recreation facilities in the Upper Colorado River Basin Reserv area sites, $2,250,000 for commencement of land acquisitions for newly authorized Cape Cod National Seashore, $1 million to contir the land acquisition program for Minute Man National Histori Park, and $1,875,000 for acquisition of lands in other park are The remainder, $8,963,400, was for strengthening the various Serv programs.

A comprehensive review of the Service's visitor fee system commenced during the fiscal year. With the provision of additio visitor facilities and additional uniformed personnel, there are number of areas not presently producing any significant amounts revenues where the charging of visitor fees is now warranted and some instances changes should be made in the fees currently auth ized. Consideration is also being given to any different types of f at might be charged to make the system more equitable or to insure alization of the full revenue potential within governing policy and inciples. The study was still in progress at the close of the fiscal ar. It will be continued and completed in the light of developments th respect to the pending land conservation fund legislation, H.R. 173 and S. 3118.

# NATIONAL CAPITAL PARKS

Legislation was passed in the Congress and signed by the President ring the year that will provide for the preservation of certain lands Piscataway Creek in Prince Georges and Charles Counties, Md., own as the Mockley Point or Moyoane Park area on the opposite le of the Potomac River from Mount Vernon. The Department is thorized to acquire the land for park purposes—approximately ,500 acres for scenic easements and 1,186 acres by outright acquisi- n. Plans are being made for early acquisition of the properties, out half of which will be donated. Thus, the use of this scenic and storic area by commercial developments or, as suggested, as a site a sewer plant, would be averted.

## isitor Center

A new visitor center to serve the ever-increasing number of visitors the Nation's Capital—on Hains Point overlooking the Anacostia d Potomac Rivers—was opened to the public on March 16 as a ot project. By the end of the fiscal year 48,087 schoolchildren d other visitors had been "oriented" at the center by means of hibits, maps, photographs, movies, and slides.

## ultural Developments

The National Capital Planning Commission and the Fine Arts mmission approved a site on Daingerfield Island, George Wash- gton Memorial Parkway, for the world's largest planetarium— oposed to be erected with funds to be raised by the Washington anetarium and Space Center. This brings closer to reality an tstanding addition to the cultural development of the Nation's pital.

The Committee appointed by the President to raise funds for the tional Cultural Center—planned for a site on the Potomac River stream from the Lincoln Memorial—is making strides toward a fillment of this long-nourished dream for a facility to meet the ed of Washington residents by providing a suitable "home" for ltural programs and exhibits.

Also proposed for construction in the District of Columbia is $10 million aquarium. One site suggested was East Potomac Pa Legislation authorizing the aquarium has passed the House. T Interior Department has endorsed the bill.

## *Memorials*

Attendance at the memorials has made a new record during t past year. A comparison of attendance for calendar years 1960 a 1961 at the six most prominent memorials and the White House given below:

| | *1960* | *1961* |
|---|---|---|
| Lincoln Memorial | 2, 488, 174 | 2, 889, |
| Washington Monument | 1, 392, 891 | 1, 592, |
| Jefferson Memorial | 926, 920 | 811, |
| Custis-Lee Mansion | 348, 166 | 321, |
| Lincoln Museum | 221, 877 | 250, |
| House Where Lincoln Died | 135, 562 | 154, |
| White House | 809, 639 | 1, 321, |
| | 6, 323, 229 | 7, 342, |

## *Glover-Archbold Park*

Expressway encroachment upon the natural beauty of this pa area, donated to the National Park Service by the Glover and Archb families, has been vigorously opposed by the Department of the In rior and the National Park Service. Legislation to prevent t development has been introduced in Congress and passed by Senate.

# Bureau of Outdoor Recreation

### Edward C. Crafts, *Director*

The Bureau of Outdoor Recreation is the newest unit of the Depart- ent of the Interior. It had its beginning with the Outdoor Recre- ion Resources Review Commission, a Commission of 15 distinguished tizens, including 8 Members of Congress, created by an act of ongress on June 28, 1958. The Commission was chaired by Lau- nce S. Rockefeller and had the assistance of an advisory council nsisting of 25 individuals from various walks of life and top-level presentatives from 15 Federal agencies. State contact officers were pointed by the Governors of every State.

## *ORRRC Reports*

The Commission reported to the President and Congress on January , 1962, submitting some 50-odd recommendations falling into 5 neral categories. These categories called for:

1. A national outdoor recreation policy.
2. Guidelines for the management of outdoor recreation resources.
3. Expansion, modification, and intensification of present programs meet increasing needs.
4. Establishment of a Bureau of Outdoor Recreation in the Federal vernment.
5. A Federal grants-in-aid program to the States.

## *Presidential Conservation Message*

On March 1, 1962, 1 month after the Commission submitted its port, President Kennedy sent to the Congress a message on conser- tion, announcing that a Bureau of Outdoor Recreation would be eated within the Department of the Interior. The President said:

> "This Bureau will carry out planning functions already assigned to the Department of the Interior and will administer the pro-

> gram of Federal assistance for State agencies I am proposi below. This new Bureau will serve as a focal point in the Feder Government for the many activities related to outdoor recreati and will work and consult with the Departments of Agricultu Army, and Health, Education, and Welfare, the Housing an Home Finance Agency, and with other governmental agencies implementing Federal outdoor recreation policies."

In the same message he stated:

> "I shall appoint an Outdoor Recreation Advisory Council ma up of the heads of departments and agencies principally co cerned with recreation—to provide a proper forum for consideri national recreation policy and to facilitate coordinated effor among the various agencies."

## *Secretary Establishes Bureau*

Both of these things were done. On April 2, 1962, Secretary Uda by secretarial order, established a Bureau of Outdoor Recreatio His order stated that the Bureau is responsible for—

(*a*) Coordination of related Federal outdoor recreati programs.

(*b*) Stimulation of and provision for recreation assistance the States.

(*c*) Sponsorship and conduct of recreation research.

(*d*) Encouragement of interstate and regional cooperation recreation projects.

(*e*) Conduct of recreation resource surveys.

(*f*) Formulation of a nationwide recreation plan on the bas of State, regional, and Federal plans.

## *Recreation Advisory Council*

On April 27, 1962, President Kennedy issued Executive Order 110 establishing a Cabinet-level Recreation Advisory Council with rotating chairmanship.

In the Executive order, the Secretary of the Interior was ma responsible, in consultation with other members of the Council "f developing methods and procedures for improved interagency coor nation in the development and carrying out of national outdo recreation policies and programs."

The order also stated that "The Council shall provide broad poli advice to the heads of Federal agencies on all important matte affecting outdoor recreation resources and shall facilitate coordinat efforts among the various Federal agencies."

These are the basic guidelines for the Bureau of Outdoor Recreatio The rapidity with which action followed recommendations w traordinary. The Commission committed itself on January 31 he President committed himself on March 1. Secretary Udall tivated one of the Presidential commitments on April 2 and the cond was activated on April 27, 1962.

## *eclarations of Intent*

In June, the Bureau of Outdoor Recreation listed a number of clarations of intent which represent the policies it will pursue:

1. Outdoor recreation needs to be vigorously advocated across the nd and in chambers where policy is made. The Bureau hopes to one of the advocates and to balance enthusiasm with realism.

2. There needs to be national and nonpolitical leadership in recrea- n. The Bureau of Outdoor Recreation as a career service should ovide that leadership. It should be intellectual leadership. There eds to be effective articulation that reaches the public heart and nd.

3. There needs to be public understanding that recreation is not ly a renewing experience but also a serious business. It is serious tional business both because of its economic impact and its bene- ial effect on the physical, cultural, social, and moral well-being of American people. It is a partial solution to the social problems eated by urbanization and leisure time. It is a solution, at least part, to the fact that man is not wholly suited physiologically to et the technological demands placed upon him.

4. The recreation business is one of the great hopes for economic provement of certain rural portions of this country that are other- se depressed. Further, the manufacture and marketing of recreation uipment and provision of recreation facilities have a major impact our economy. The investment in men, money, and resources volved in the manufacture, use, and operation of sporting arms, hing tackle, camping equipment, pleasure boats, winter sports uipment, pleasure trailers, recreation roads, resort hotels, motels, lges, and dude ranches, and the recreation press is tremendous. l of this is recognized in the new Bureau.

5. There is need to professionalize recreation education in colleges d universities. Persons currently engaged in providing recreation others comprise a multitude of disciplines—geographers, foresters, dscape architects, zoologists, physical education majors, engineers, d so on. Recreation conservation needs to be recognized profes- nally as other fields of conservation are today. There is the other e of the coin, too; the education of those who wish to partake elligently and effectively of recreation opportunities. More is being ne in this field than in the education of the professional technician outdoor recreation.

6. The Bureau of Outdoor Recreation is and should continue be small in terms of personnel and money. Though it be small men and dollars, the Bureau hopes to loom large in policy and contribution to the welfare of the American people.

7. There will be no empire building in the Bureau. The prima emphasis of the Bureau should be on assistance to the States, to loc instrumentalities of government, and to private enterprise. T Bureau hopes to facilitate, to aid, and to be a catalytic agent.

8. The Bureau will not be a land-managing agency. Its duti will be policy, planning, long-range programs, and coordinatio The emphasis should be on quality—not quantity; improvement standards and facilities, attraction of better personnel, and broadeni of vision.

9. Most of the people are where the land is not. Recreati opportunities need to be made more accessible to people; so much the emphasis of the Bureau will necessarily be in the East and on t west coast where population concentrations occur.

10. In the Federal area, the Bureau function is coordination, pr graming, and promotion of Federal acquisition of certain properti needed for the furtherance of the recreation aims of the nation forest and park systems, certain wildlife refuges and game range and the Federal reservoirs.

11. The objective of correlation may be achieved through legislati review, budgetary review, conference, consultation, and the respe and stature which the Bureau may gain over a period of time as w as the force of public opinion which may develop behind it.

12. The Bureau of Outdoor Recreation is not another Nation Park Service or another Forest Service. Its orientation, scop approach, and objectives are quite different from any existing agen of government, Federal or State. It is in a very real sense of ne experiment in government.

13. The emphasis of the Bureau will be oriented first toward t needs of the people and then on effective utilization of a specific la and/or water resource.

14. The Bureau will push vigorously for the legislation, funds, a policies it believes in the public interest.

15. Outdoor recreation plans should lead to action. The Bure will not knowingly engage in planning which finds its use only wi students and in reference libraries. Planning and programing a primarily significant in direct relation to the results stemming fro them.

## ureau Organization

The Bureau has been organized with a Director, Associate Director, vo Assistant Directors, and six Divisions.

The Divisions are (1) Cooperative Services, (2) Planning and irveys, (3) Federal Programs, (4) Education and Interpretation, ) Research, and (6) Administrative Services.

## residential Statement

Two points which the President made in his talk at the White ouse Conference on Conservation in May, 1962, are of particular terest. In emphasizing the need to apply science to conservation, e President said that the successful application of science to conser- tion may result in a great deal more lasting benefit to a particular untry than being first in space. He also said, "I don't think there s anything that could occupy our attention with more distinction than ying to preserve for those who come after us this beautiful country ich we have inherited."

# *Office of Territories*

## Richard F. Taitano, *Director*

The new programs and policies of the Secretary of the Inter which were put into effect in all of our offshore areas have resulted i substantial political, economic, and social advancement during fis 1962.

The high degree of responsibility shown by the people of the Virg Islands in administering their government prompted Preside Kennedy to send a message to the Congress urging the enactment home rule for the islands, including the right to elect their o Governor. Legislation to provide for the popular election of t Governor of Guam was also introduced into the Congress and receiving the Department's wholehearted support.

In the Trust Territory of the Pacific Islands, a review of nee resulted in enactment of legislation more than doubling the appropr tion ceiling for the area. It is the Administration's aim to pla education in the trust territory on a basis comparable to that in t United States, as well as to improve political and economic develo ment. Political progress was made in the trust territory with t transformation of the Advisory Council into the Council of Mic nesia, and the election by secret ballot for the first time of delegates the annual conference of the Council.

In American Samoa, new awareness has brought an increased acti to meet the needs of that South Pacific territory, and a major eff was begun to meet these urgent requirements. Substantial progr has been made. In all territories, new programs were put into eff reflecting a greater use of the human resources of the territory a the provision of a better way of life for the people.

# *Guam*

The relaxation of entry requirements imposed by a 1941 Presidential der highlighted the fiscal year in Guam and paved the way for a new titude of confidence in the business and governmental communities this Western Pacific territory. U.S. citizens may now enter the and without undergoing naval security clearance. The removal of is requirement enabled Guam, for the first time, to begin developing ourist industry which can appeal to the thousands of visitors who vel to the Far East each year. The Guam government negotiated sale of a land parcel overlooking historic Adelup Point for con- uction of a 100-room resort hotel, to be completed in 1963.

With a total operating budget of $13,471,597, Guam spent ,293,290 on badly needed capital improvements.

The 750-student Barrigada Junior High School, costing $603,190, d the 720-student Barrigada Elementary School, costing $466,530, re pushed toward completion for the September 1962 school term.

A contract was approved and the foundation laid for a new $245,865 ssroom building at the College of Guam, and architects began work plans for a new $450,000 courthouse in Agana.

Buildings to house the commissioners' office, fire and police units d health centers were completed in five villages and contracts let similar structures in three other villages.

Plans were completed and funds appropriated for two village class- m additions, an improved telephone exchange for Merizo, and a jor water reservoir for Talofofo.

The island's highways underwent a concerted rehabilitation progam a cost of $406,890, three new beach parks were completed, and avy growths of unsightly and unhealthful jungles were cleared from cant lots in Agana, the capital city.

Space formerly used for tuberculosis patients at the Guam Memorial spital was converted at minimum cost into a modern psychiatric rd, eliminating the need to send mental patients off-island for treat- nt.

The first school for practical nurses was started and negotiations npleted with the Commission on Accreditation of Hospitals for a vey which should bring full accreditation and improve the off- nd recruitment of professional people.

Public health services were expanded in the villages and an inde- ndent laboratory was established to greatly improve continuing earch in diabetes, gout, high blood pressure, and obesity, ailments ich are prevalent among Guamanians.

*A new, sturdy fence has been completed around a 125-acre pasture, reclaim*
*from the military, which is being developed as a demonstration point*
*stimulate ranching on Guam. Government herds will be grazed in t*
*pasture.*

An economist, on loan from the Department of Interior, complet
a survey and plan of action designed to qualify Guam under the Ar
Redevelopment Act.

The Guamanian Departments of Labor and Personnel and Educ
tion took initial steps through the U.S. Department of Labor f
participation in the Manpower Development and Training Ac
This should lead to elimination of unemployment on the one hand a
a shortage of properly trained workers for local civilian and milita
trade jobs on the other.

*floor in Guam Memorial Hospital which formerly was used for tuberculars s been converted into a modern psychiatric ward, eliminating the need to d serious mental cases off island for treatment.*

Safeguards governing off-island recruiting were strengthened and ne longstanding double standards governing recruitment and omotion of Guamanians and off-islanders in the education department were removed.

In the public schools, enrollment passed the 14,000 mark. Teachers rticipated, on a voluntary basis, in special courses in the English guage for over 600 pre-school children from Chamorro-speaking nilies.

Steps were taken toward the accreditation of the College of Guam as -year school by the Western College Association.

In line with President Kennedy's physical fitness program, Guam's ools initiated a full-fledged athletic training plan, which will lude all grades and will speed the development of interscholastic npetition.

The Sixth Guam Legislature completed active sessions, with the ssage of a bill revising the island's tax structure among its major complishments. The legislature also adopted a resolution favoring pular election of the Governor of Guam.

*The foundation is laid for a new $245,865 classroom building at the Coll of Guam. Another classroom building, library, and cafeteria-recreation b are in the background.*

# *Trust Territory of the Pacific Islands*

In the fiscal year, the President transferred jurisdiction over t Saipan District in the Northern Marianas to the Secretary of t Interior from the Secretary of the Navy, effective July 1, 1962. Th entire trust territory thus will be unified in administration under t High Commissioner. Effective July 1, the former Saipan and R Districts will be combined into the Mariana Islands District. At t same time, the administrative center of the trust territory will b transferred from Guam to Saipan.

Emphasis in administration was given to projects to foster edu tional and political advancement and for increasing the Micronesi income. An economic survey was undertaken by an economist fr the Department of the Interior in Washington. Efforts were made t promote new outlets for trust territory products and to prov guidance in production to meet market acceptance, capitalizing up fish from the sea, and food, wood, and fibers from the land.

*isplay of Micronesian handicraft articles at Trust Territory of the Pacific lands headquarters.*

Steps were taken to open the territory to commercial fisheries velopment. A school of fisheries was established, and a group of e trainees, after indoctrination, was sent to Hawaii for experience large-scale tuna fishing.

A farm institute to train Micronesians in agricultural practices was ganized in Ponape District, facilities constructed and opening date for July 1, 1962. Farmers' markets at district centers were stained, and increased sales recorded. To further implement ricultural development, administrative directives were given to rmit a step-up in the homesteading program.

Rehabilitation of coconut groves continued with a quarter million w plantings; a soapmaking project was initiated, using coconut oil a basic ingredient. Cacao cultivation also was extended, with 0,000 cacao trees planted during the year. Plantings of spices and her potential cash crops were increased. Marketing of handicraft icles was activated at headquarters. New branch banks were ened in two districts, and the organization of local cooperatives and edit unions was given administrative support. Two small local oadcasting stations were established, and provision was made for

*Micronesian medical men, in advanced training at Naval Hospital, Gua*
*are attending a tumor clinic with naval medical officers.*

operation of such stations in all districts. Radio broadcasting
considered one of the most important communication tools f
development of the islands.

Since transportation requirements of the area—which encompass
97 inhabited islands and some 3 million square miles of water—a
great, major consideration was given to means of improving faciliti
and schedules. One new airfield was started; rehabilitation of an ol
Japanese landing field was nearing completion, and a third was bein
planned. Simultaneously, a DC–4 craft was purchased to suppl
ment the air service provided by two small amphibians. To augmen
district field-trip operations, a new 500-ton ship was acquired.

In-service training of Micronesians from district staffs was carrie
out in various departments at headquarters, on rotation schedule
Groups of island medical and dental officers, and nurses, learne
advanced techniques in special courses arranged at naval facilities i
Guam. More than 100 Micronesians, some on Government schola
ships, others privately supported, were enrolled at colleges in Gua
Fiji, the Philippines, and the United States, in preparation for caree
in government, business, teaching, medicine, law, agriculture, fisherie
and the trades. Secondary education was provided at the Pacif
Islands Central School in Ponape, and by private sponsorship at hig
schools in Guam.

*newly acquired DC–4 plane is scheduled to begin trust territory inter-*
*trict service, augmenting amphibian plane service already in operation.*
*e new craft will carry 40 passengers plus cargo.*

New emphasis was given to the teaching of English throughout the
hool system. A year was added to the curriculum of the inter-
ediate schools in each district, beginning with the 1962 fall term.
comprehensive building program to provide adequate elementary
hools was planned. It is intended that the trust territory will
ome a convincing demonstration to the world of the sincere interest
the United States in the welfare of all peoples under its flag.

## *Alaska Public Works*

In 1949, Congress authorized a $70 million program of public works
Alaska to foster economic and social development through provision
facilities for community life. This 5-year act was later extended
June 30, 1959. Under this program the Federal Government,
on application by a public body in Alaska, has financed the entire
t of construction of approved projects and, upon their completion,
nsferred them to the public bodies for whom they were built at

prices that will return to the Treasury of the United States not l than 50 percent of the total cost.

The program has provided basic community facilities and otl essential public works. These are a major contribution to Alas and have materially assisted its communities in meeting the deman of the very rapid population growth of the past ten years.

The total 172 projects were physically completed as of June 3 1962. These projects with a total value of $69,297,160 have provid 61 school units, 13 hospitals and health centers, 8 municipal buildin 50 sewer and water projects, 27 other projects including stree utilities and small-boat harbors, and 22 units for emergency reli This completes the Alaska public works program.

## *American Samoa*

During the early part of fiscal 1962, every phase of Government w devoted to the planning of a complete rehabilitation program f American Samoa. The new Governor with the strong support of tl Department spent the early months of the year outlining a 3-ye rehabilitation program that would strengthen and reorganize eve phase of public service in American Samoa. While the program goa were to provide Samoa with good public services in all fields and encourage industry and commerce so as to provide an economic bas the first year's program was concentrated on completing those publ projects which were needed for the Fifth South Pacific Conferenc which was held in Pago Pago in July 1962.

The first phase of the program was accepted by the Congress and total of $9.5 million of Federal funds and $1 million in local funds wa appropriated and made available by October.

### *Construction*

At the request of the Governor, a skilled survey team of topfligh naval engineers reviewed the existing and proposed constructio projects and made general recommendations. An agreement wa completed with the 14th Naval District in Pearl Harbor whereb skilled engineers and technicians were loaned to the government o American Samoa on a reimbursable basis to assist on the project authorized in the rehabilitation program. These technicians not onl supervised the various construction projects, but also trained man Samoans to do their work. The technicians were returned to Honolul upon the completion of the training.

Later in the year, two detachments of the 14th Naval Distric Reserve Construction Battalion volunteered a month's reserve trainin

*mpletion of a new international jet airstrip on American Samoa will open*
*e scenic wonders of this tropical paradise to world travelers.*

ty in the territory to provide further assistance in the construction
ogram.

By March 1962, virtually every able-bodied man in Samoa was
orking 10 hours a day, 6 days a week, to insure completion of the
ost-needed projects by July 1. By this date an imposing list of
ojects was completed and were ready for the Conference. They
cluded a 9,000-foot jet runway, which will provide facilities for
rough jet service from Hawaii and west-coast points to Australia
d eventually New Zealand; a striking Polynesian style civic audi-
rium that seats 800 people; a new powerplant with two 1,000-
owatt diesel-electric generating units and with additional space to
expanded to 6,000 kilowatts in the following fiscal year; 27 new
using units for government employees; 3 new high school buildings;
miles of new paved highway from the airport to downtown area,
th a contract let for an additional 12 miles to be completed by
tober; a complete renovation of many public buildings and a
vernment cleanup campaign which included the tearing down of
zens of old, dilapidated government buildings throughout the
and.

A general cleanup and paintup campaign was sponsored by t government and through the sale of paints at cost over 90 percent the buildings on the island of Tutuila were painted by July 1.

## *Education*

An agreement was completed with the University of California Berkeley to assist in the recruitment of outstanding teachers and new teachers were hired to bolster the school system. With the thr new high school buildings and the new teaching staff, for the fi time American Samoa was prepared to enroll 100 percent of h graduates from the intermediate schools. Heretofore only one-thi had been enrolled.

Among the many steps taken to bolster the grossly inadequa elementary school system was the Governor's proposal for an educ tional television system which, through the use of a dozen outstandi teachers in the studio, could bring the best in teaching to some 3 classrooms that are now being staffed by poorly trained local teache

*Samoa's new civic center—to be used by students, the general public, and th legislature—is called "The Turtle" by Samoans. In the background are new school and housing facilities.*

It would also be the medium for adult education, ranging from such subjects as public health to classes in self-government. With the enthusiastic support of the Secretary, the Congress appropriated funds for a survey of the feasibility of such a program. The National Association of Educational Broadcasters made a survey of the possibilities and made a strong report recommending the system. By the year's end the Congress had adopted the program and advance planning was underway.

Other steps taken to bolster the basic system included a dropping of the entrance age for schools from 7 to 6 years. Salaries for stateside-qualified teachers were increased by one-fourth and a comprehensive new construction program to replace all inadequate school buildings was presented and approved by Congress. An agreement was reached with the University of Hawaii to train 20 Samoans in agriculture and home economics under the Area Redevelopment Administration Act.

## *Health*

A team of doctors from Yale University and the University of California at San Francisco was brought to Samoa to survey overall health needs and an additional team from the U.S. Public Health Service to initiate the planning for a new hospital. An agreement was entered into with the Hawaii Medical association whereby they agreed to send experts to American Samoa for a month of free service in specialized fields. Four surgeons under this program had given outstanding service by the end of the year and many specialty cases were located and corrected.

Arrangements were made with the State of Hawaii to care for mentally ill persons from American Samoa and also to provide facilities for the hospitalization and medical treatment of unusual diseases which could not be treated in Samoa. An agreement was reached with the University of California at Los Angeles for a filariasis and internal parasite-control program and three doctors from that university were in service in American Somoa before the year's end.

## *Agriculture*

Several thousands of various varieties of citrus and nut trees were planted in American Samoa during the year. A widespread poultry program was instituted and steps were taken to improve existing agriculture crops.

A marketing specialist from Washington, D.C., made a survey of marketing facilities with a view to strengthening a very inadequate system.

## *Legislature*

The legislature was called into special session in November and, during this and the regular session in March, 29 bills were passed that virtually rewrote the Code of American Samoa, which was out of date.

The groundwork was laid for replacing law by executive regulations with legislative law.

*Visitors inspect the Samoan fish cannery. Efforts to attract industry to the island have resulted in plans for construction of an additional fish processing plant which will provide new employment for 300 Samoans.*

### *Economic Development*

A contract was signed for the establishment of a coconut processing plant in the Pago Pago area which will process all of American Samoa's fresh coconuts and will spur coconut production throughout the territory. The bulk of the coconuts for the plant, however, will come from Tonga and Western Samoa and will increase trade between these areas and American Samoa, thereby creating many new jobs. While the basic process of obtaining fresh coconut oil will create jobs for approximately 100 American Samoans, several specialty products, such as coconut flour, cocomats, charcoal briquets from coconut husks, and various derivatives from coconut milk, are planned, which will add additional jobs.

Negotiations were virtually completed for a second fish cannery and plans were about complete for the formation of an all-Samoan development corporation to build a hotel and other facilities to provide the basis for a tourist industry. At the end of the year $150,000 had been pledged from hundreds of workers and other Samoans for such a development. While three other corporations were negotiating for hotel sites, these were being held in abeyance pending the completion of the Samoan corporation's plans.

An additional spur to Samoa's tourist potential was the inauguration in March of 1962 of the South Pacific Airline's service between Honolulu, Tahiti, and Samoa.

## *Virgin Islands*

Housing, the No. 1 problem of the islands, was revitalized by the appointment of a housing coordinator; establishment of a local office of the Federal Housing and Home Finance Agency; speeding up of emergency housing construction in St. Thomas and renovation of public villages in St. Croix; commencement of a resettlement project in one of the worst slum areas; and at year's end by the creation of a new department of housing and community renewal.

The fiscal year marked the emergence of the College of the Virgin Islands. Firm plans have been made to open the college as a 2-year institution in July 1963.

Positive steps were taken within the department of education toward improving the quality of instruction at all levels of education and toward achieving accreditation for the islands' high schools. Rehabilitation of outmoded physical plants and construction of new schools were started to solve the problem of classroom shortage and inadequate physical facilities.

*Governor Ralph M. Paiewonsky, flanked by officials of the Virgin Islands government including the president of the legislature, Honorable Walter I. M. Hodge, dedicates the deepwater pier at Frederiksted on the island of St. Croix. This pier costs $1,200,000, is 1,651 feet long, and can accommodate ships up to 40 feet draft—the only deepwater dock on the island of St. Croix.*

## *Tourism and Trade*

Widely expanded activities were conducted to promote tourism and trade. Congress granted the Virgin Islands a special customs exemption of $200 for returning tourists. As a direct result, customs dues increased from $502,000 in fiscal year 1961 to $890,000 in fiscal year 1962. Expenditures by tourists leaped to approximately $35 million from $25,800,000 in the preceding year. Cruise-ship calls exceeded all previous records.

Eleven new industries located in the Virgin Islands. The largest single industry ever to come to the islands will be an alumina processing plant for which facilities have been made available in St. Croix. Excise taxes on liquors shipped to the United States were at an all time high of $7,700,000. The National Park Service expanded and improved its facilities on the island of St. John and established the

Buck Island Undersea Park, expected to become a prime visitor attraction, on St. Croix.

## *Fiscal Improvements*

A management survey and design for a new centralized accounting system were prepared to commence operations in July 1962. The income tax administration program was surveyed by the U.S. Department of the Treasury and reorganization to improve tax collection services is in process. Total revenues of the islands jumped to $11,134,000—an increase of 25.5 percent—the highest on record in the history of the territory.

A professionally directed real property reassessment program resulted in an increase of 44 percent in real property tax collections from $348,000 in 1961 to $503,000 in 1962. These taxes should increase well over 100 percent within 4 years.

*A three-bedroom, modern concrete blockhouse which will be the model for a community resettlement project in St. Thomas, initiated and financed by the government of the Virgin Islands. A building and a 3,000-square-foot lot will be sold to prospective homeowners for not more than $10,000.*

## *Public Works*

In public works, a contract was awarded for hauling garbage to the sea in St. Thomas. The money value of construction completed and initiated was $6,945,000 on 40 projects, principal of which were 6 schools, airport extension on St. Thomas to handle turboprop planes, construction of a deepwater pier at Frederiksted, and construction of a jet airstrip on St. Croix. Jetplane service from the mainland to the Virgin Islands commenced in June 1962. The program of exploration for fresh water on St. Croix was successful.

Medical services were strengthened by the addition of a modern annex to the hospital at St. Croix to meet the need of the outpatient clinics and the addition of an up-to-date formula room in the hospital in St. Thomas.

An apprenticeship and training program was started. The home for the aged in St. Croix was renovated and with improved staff is resulting in 100 percent improved care. An inspection of prisons was made by the Director of the U.S. Bureau of Prisons, who recommended that a new and modern prison be built.

## *Legislation*

Cooperation between the legislative and executive branches of the government was outstanding.

Important legislative enactments included a new civil rights law, an Unemployment Compensation Act, a new Industrial Incentive Act, a zoning and subdivision law, a Motorboat Act, a Housing Act, and liberal appropriations to finance the various public improvements mentioned in preceding sections of this report.

## *Government Comptroller*

A cashier receipts and disbursements section was inaugurated during the year which will assist materially in auditing expenditures of the Government of the Virgin Islands. The office assisted in the preparation of the Property Manual of the Government of the Virgin Islands; participated in revising the industrial incentive program, and was instrumental in establishing an entirely new system accumulation and reporting of leave in the local government.

The fiscal year was most productive in that 20 audits were completed thereby bringing that phase of operation on a current basis. The disclosure made by the office during the audit of the lottery division enabled the local government to take positive action by way of legislation.

*To relieve the serious classroom shortage, this elementary school in St. Thomas was dedicated by Secretary of the Interior, Stewart L. Udall, on March 16, 1962. Built at a cost of $174,000, it contains 8 classrooms, 1 cafeteria-auditorium and can accommodate approximately 250 students.*

## *Virgin Islands Corporation*

The most significant contribution made by the Corporation during the year was placing in operation the new saline water distillation plant on St. Thomas. The production of potable water has exceeded the rated capacity of the plant by more than 25,000 gallons per day. This conversion of sea water to potable water will alleviate greatly the perennial shortage of water on the island of St. Thomas and reduce the quantity of water barged from Puerto Rico at high cost.

The 1962 sugarcane crop was better than average, but considerably ess than the 1961 crop, which was the best in the history of the Virgin Islands. A total of 114,871 tons of sugarcane were ground and 10,757 tons of sugar, raw value, manufactured. The average production of sugarcane per acre was 31.12 tons for the Corporation and 21.89 tons for the growers. The grinding season started on February 21, 1962, and ran for 98 days. All of the sugar produced was shipped in bulk in late June. The acquisition of conveyor equipment by VICORP for loading the ship at the new dock in Frederiksted resulted in decreased loading expenses, thus giving higher income to both the Corporation and the sugarcane growers.

## *Power*

The demand for power continued to grow in St. Thomas, and the increase in peakload over the previous year was 21.6 percent. A steam turbine generator was installed in connection with the salt water distillation plant and increased available output by 3,000 kilowatts. The extension of the distribution system on St. John continued and power will soon be available throughout all areas of the island.

The increase in peakload in St. Croix over the previous year was 38.4 percent, the highest ever recorded. The economy of St. Croix has expanded rapidly as a result of jet aircraft service and a new deep-water pier at Frederiksted.

## *Conservation*

A total of 20 earth dams were constructed under the soil and water conservation program during the year in cooperation with the U.S. Soil Conservation Service and the Virgin Islands Soil Conservation District Board. The 4 dams constructed on St. Thomas had an estimated capacity of over 1 million gallons and the 16 on St. Croix totaled nearly 15 million gallons. The government of the Virgin Islands undertook an extensive well-drilling program in St. Croix during the year and brought in a number of wells which will greatly alleviate the water shortage. There is no doubt that the success of the well-drilling project can be attributed in a large part to the dams which have been constructed by VICORP over the past 8 years. This program has been taken over by the government of the Virgin Islands as of July 1, 1962.

The U.S. Forest Service continued to cooperate in our forestry program, through providing personnel and technical assistance. The activities continued to be primarily reforestation, improvement of existing forest areas, and making forest products available to the public. The sawmill was operated intermittently and mahogany and other local hardwoods were milled for use by local furniture manufacturing industries.

The food production and livestock programs were continued in cooperation with the Federal Agricultural Station. The commercial plantings of mangos, avocados, and macadamia nuts continue to do well, but it will be several years before they will bear fruit.

The Corporation continued the management of the Navy properties on St. Thomas for the Department of the Interior. Income from the properties increased to $365,381, which is more than three times the income being received when the properties were taken over by VICORP on July 1, 1954.

# *The Alaska Railroad*

## John E. Manley, *General Manager*

Gross revenues of the Railroad amounted to $14,455,224.81. Expenses, including depreciation charges of $2,136,279.78, were $14,202,124.40. The net income of $253,100.41 represents an increase of $453,238.89 over the prior year accounted for as follows:

| | |
|---|---|
| Increase in revenues | $146, 929. 70 |
| Decrease in expenses | 306, 309. 19 |
| | 453, 238. 89 |

The Railroad carried 1,447,966 revenue tons of freight, an increase of 10.25 percent compared with the prior year. The number of revenue passengers dropped to 67,417 from 82,742 carried during the prior year, or a decrease of about 22.6 percent. The decline in the number of passengers was largely compensated, however, by increases in passenger-miles, revenue per passenger, and revenue passengers per train. Passenger revenues were but $25,273.49 below those of fiscal year 1961.

Revenues from transportation of mail dropped $104,000 compared with the prior year due to the establishment of mail-truck service to Alaska from Seattle.

The advantages of containerized freight were increasingly apparent during the year. To meet the growing demand for this type of service, 50 additional cargo containers and 25 shipping platforms were acquired. The use of these cargo containers and shipping platforms has, to a large degree, offset the constantly increasing cost of longshore labor in terminal operations. Costs of handling the containers over the Seward Dock will be materially reduced when four large straddle trucks are placed in service.

The use of these straddle trucks will transfer the operation of loading containers to flatcars away from shipside to the backup area of the dock. The elimination of this congestion at shipside will reduce the lay time of vessels and economies will reflect to them as well as The Alaska Railroad. Delivery of these modern devices is expected in mid-September.

*The arrival of Canadian National Railways barges started in May 1962, bringing new service and substantial economies*

With the arrival of the first Canadian National Railways rail barge t Whittier on May 18, 1962, a new type of service became a reality. The movement of freight in cars by barge from Prince Rupert to Whittier for subsequent handling by The Alaska Railroad is expected o result in substantial economies in heavy shipments originating east f the Missouri River. The barge slip at Whittier was constructed by he Railroad at a cost of about $250,000.

Better service and substantial economies will result for The Alaska Railroad by the new barge service of the Canadian National Railways whose first barge arrived at Whittier, Alaska, in May 1962.

# Office of the Assistant Secretary Water and Power Development

## Kenneth Holum, *Assistant Secretary*

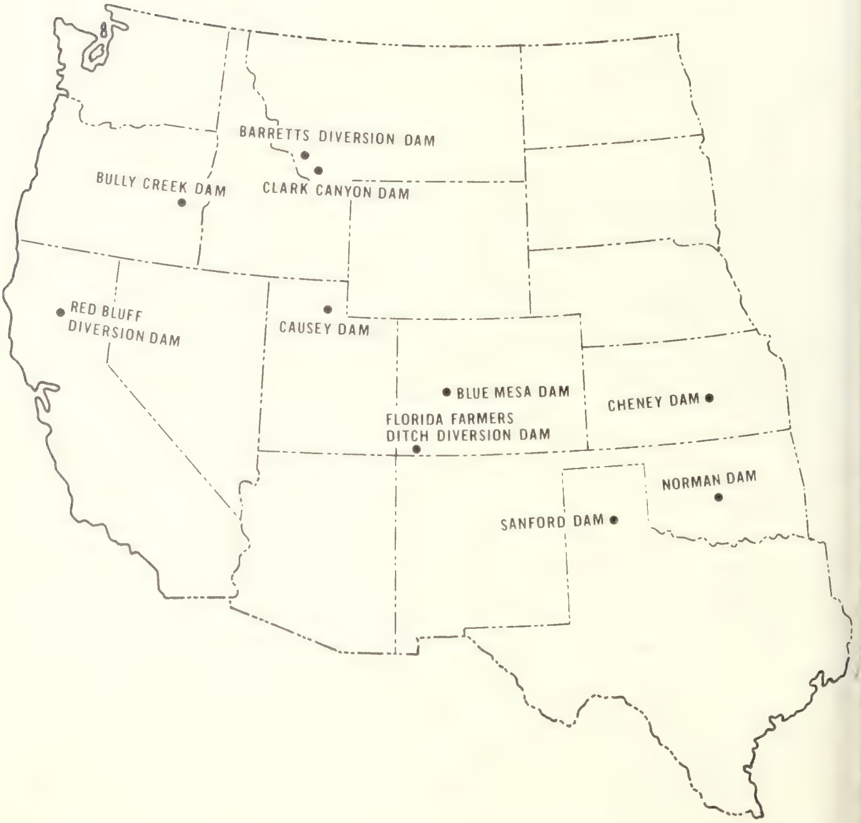
The Assistant Secretary for Water and Power Development acts r the Secretary in implementing this area of the Department's ogram. He exercises secretarial supervision and direction over the ureau of Reclamation, Bonneville Power Administration, Southstern Power Administration, Southwestern Power Administration d the Office of Saline Water.

Largest and oldest of these agencies is the Bureau of Reclamation hich constructs water-use projects primarily for the reclamation arid and semiarid lands in the West and markets electric power om projects built by itself, the International Boundary and Water ommission, and the Corps of Engineers in the 17 Western States, clusive of the Bonneville Power Administration's area.

Bonneville Power Administration, Southeastern Power Administran, and Southwestern Power Administration are power marketing encies. Along with the Bureau of Reclamation they market all ctric power generated from all federally built water-resource velopment projects and facilities.

Bonneville's market area is a four-State area of the Pacific Northst. Southeastern sells power in Southeast States and Southstern Power Administration in the Central Southwest States. The Bureau of Reclamation, Bonneville Power Administration, d the Southwestern Power Administration have constructed and erate extensive high-voltage transmission systems. Activity is continuing on studies for interconnections of Federal systems, with particular progress being made on a proposed Pacific Northwest-Pacific Southwest high-capacity intertie and an interconnection between the Southwestern Power Administration and the Bureau of Reclamation. Studies are in progress on an experimental segment of direct current line to provide design data which will be utilized for construction of a high-voltage, direct-current transmission interconnection.

## CONSTRUCTION STARTS
### FISCAL YEAR 1962



Power is marketed under the following sets of principles established by Congress and policy:

1. Preference in power sales shall be given public agencies and cooperatives.

2. Domestic and rural consumers shall have priority over other consumers in the disposal of power.

3. Power shall be sold at the lowest possible rates consistent with sound business principles.

4. Power disposal shall be such as to encourage widespread use to prevent monopolization.

Pertinent data covering hydroelectric power marketing by the Department of Interior agencies in fiscal year 1962 are summarized n the following table:

*Power production and marketing data, fiscal year ended June 30, 1962*

| Marketing agency | Installed capacity, as of June 30, 1962 (kilowatts) | Net energy generated (million kilowatt-hours) | Energy marketed (million kilowatt-hours) | Gross revenue (thousands of dollars) | Percent of power marketed to preference customers |
|---|---|---|---|---|---|
| ureau of Reclamation | [1] 6,396,085 | 26,734 | [2] 14,528 | [3] 56,660 | [4] 86.3 |
| onneville Power Administration | [5] 4,237,000 | [6] 19,192 | 29,157 | 74,483 | [7] 43.4 |
| outhwestern Power Administration | [8] 791,000 | 2,239 | 2,366 | 16,075 | 71.5 |
| outheastern Power Administration | [8] 1,399,400 | 4,470 | 4,424 | 23,212 | [9] 33.5 |
| Total | 12,823,485 | 52,635 | 50,475 | 170,430 | |

[1] 5,294,550 kilowatts in Bureau of Reclamation plants; 1,070,035 kilowatts in Corps of Engineers plants; nd 31,500 kilowatts in International Boundary and Water Commission plants.

[2] Excludes 12,188 million kilowatt-hours delivered at Grand Coulee, Hungry Horse, Chandler, and Roza owerplants by Bureau of Reclamation to Bonneville Power Administration.

[3] Excludes $16,978,000 revenue received by Bureau of Reclamation from Bonneville Power Administration.

[4] Excludes energy delivered to Bonneville Power Administration.

[5] Excludes capacity from Bureau of Reclamation powerplants from which Bonneville Power Adminis- ation markets power. This capacity totals 2,252,250 kilowatts at Grand Coulee, Hungry Horse, Chandler, nd Roza powerplants.

[6] Does not include generation at Bureau of Reclamation projects.

[7] Excludes deliveries to Federal agencies.

[8] Capacity in Corps of Engineers projects.

[9] In addition, 53.2 percent of the total energy was marketed to Tennessee Valley Authority.

The Department's program to develop low-cost methods of con- erting sea and brackish water to fresh, conducted by the Office of aline Water, moved ahead during the year at an accelerated pace. asic and applied research activities were expanded; a 1-million- allon-per-day sea-water conversion demonstration plant was com- leted and placed in operation at San Diego, Calif.; a 250,000-gallon- er-day brackish water plant began supplying desalted water to Vebster, S. Dak.; and ground was broken for a 1-million-gallon-per- ay plant at Roswell, N. Mex.

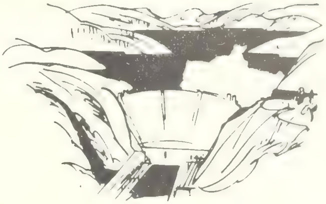
Certain defense functions dealing with electric power have been elegated to the Department. These responsibilities are discharged y the Assistant Secretary through direction of the Defense Electric ower Administration. Under this program, a field organization ands ready to handle specific postattack power problems. It is ade up of 16 power areas within the continental United States and 3 hers—Alaska, Hawaii, and Puerto Rico-Virgin Islands, each headed y a director with a deputy and an alternate. Power liaison personnel ave been appointed to each of the OEP–OCD regional offices, designated for each State and most of the local civil defense offices throughout the Nation.

The Assistant Secretary conducted numerous conferences in Washington and in the field on power marketing problems and irrigation matters with water and power consumer groups, congressional delegations, and representatives of industry and local interests. He testified before congressional committees and appeared before interagency groups.

During the year, the Office of Assistant Secretary reviewed 136 reports of the Corps of Engineers, Department of the Army, primarily for flood control and navigation improvements; 20 Federal Power Commission applications for permits and licenses to build hydroelectric projects; and 58 Department of Agriculture watershed work plans.

# Bureau of Reclamation

## Floyd E. Dominy, *Commissioner*



In carrying out its construction activities for fiscal year 1962, the ureau of Reclamation of the Department of the Interior moved gorously forward in its program of developing water and land sources in the Western United States and made important con- ibutions to the expansion of the Nation's resource base. Con- ruction contracts totaling more than $150 million were completed n Reclamation project works, representing an investment in dams, rigation canals, power and pumping plants, electric transmission nes, and other facilities available to serve the West and the Nation.

Construction completed during the year added more than 178,000 re-feet of water storage in new Reclamation project reservoirs; ,000 kilowatts of hydroelectric generating capacity; 335 miles of nals, pipelines, laterals, and drains; 15 pumping plants; and 375 iles of high-voltage transmission lines.

The total value of all contracts awarded in fiscal year 1962 amounted about $182 million, comprising the total value of more than 1,260 parate contracts for construction, materials, equipment, and supplies. this total amount, construction contracts accounted for about 67 million, or about 92 percent. The 215 construction contracts force at the end of the fiscal year had a total value of about 77 million.

Bureau of Reclamation program accomplishments in a year of ord endeavor reached 86.3 percent of fiscal year 1962 program jectives under its direct control. This is the best level of per- mance achieved by the Bureau in its 60-year history. One region gion 5—accomplished 93 percent of its program objectives.

Total expenditures for the fiscal year, including the loan progra and funds transferred to other agencies, amounted to $347 millio also a record.

The fiscal year 1962 program was accomplished with an averag Bureau employment of less than 11,000 employees, compared wit an average maximum of as high as 19,000 employees in previo years.

The fiscal year will be remembered for the completion of Sherma and Red Willow Dams on the Missouri River basin project, both i Nebraska, and Paonia Dam on the Paonia project in Colorado. O the Central Valley project in California, construction was complete on the 17.5-foot-diameter, 11-mile-long Clear Creek tunnel, one the longest irrigation tunnels in the world. On the Boulder Canyo project, Arizona-Nevada, the 95,000-kilowatt unit N–8 was installe in the Hoover powerplant, bringing the plant to its full capacity 1,344,800 kilowatts.

The fiscal year was highlighted by the start of construction seven major storage dams and three diversion dams—Sanford Dam Canadian River project, Texas; Cheney Dam, Wichita project

*The first rock is blasted from the canyon walls of Gunnison River, Colo., a ground-breaking ceremonies for Blue Mesa Dam.*

ansas; Blue Mesa Dam, Curecanti unit of the Colorado River orage project, Colorado; Causey Dam, Weber Basin project, Utah; lark Canyon Dam, Missouri River basin project, Montana; Norman am, Norman project, Oklahoma; Bully Creek Dam, Vale project, regon; Red Bluff Diversion Dam, Central Valley project, California; arretts Diversion Dam, Missouri River basin project, Montana; and lorida farmers ditch diversion dam, Florida project, Colorado.

The year was notable also for the placement of the three-millionth bic yard of concrete in the 4,865,000-cubic-yard Glen Canyon Dam May 1962, and by the placement of 730,000 cubic yards in the 0,000-cubic-yard Flaming Gorge Dam, both major features of the olorado River storage project, in Arizona and Utah, respectively.

Other important construction activities on the five-State storage oject were the awarding of the contracts for completion of the en Canyon Dam, switchyard, and powerplant, and for the com- etion of the Flaming Gorge powerplant and switchyard. Con- uction of the 26-million-cubic-yard earthfill Navajo Dam on the orage project in New Mexico was essentially completed by the end the fiscal year, the first major storage feature to be completed on e project.

A signal accomplishment of the year was the awarding of five ntracts, each having a value of more than $1 million, for construction transmission lines on the Colorado River storage project. Among ese contracts was the $12,847,830 contract for construction of the 0-mile line to extend from Glen Canyon powerplant in northern izona to Pinnacle Peak in the same State. The voltage of the e—345,000 volts—will be by far the Bureau's highest.

*The "Statistical Appendix to the Annual Report of the Commissioner" contains complete annual and cumulative data on the Bureau's irrigation, municipal water, and power accomplishments, measured in both dollars and physical units, together with related investigations, construction, operation, and administration information.*

## *Construction Highlights*

A significant construction event of the fiscal year was the placement the three-millionth cubic yard of concrete in the Glen Canyon Dam May 15, 1962. The 710-foot-high concrete arch dam is the key ture of the Colorado River storage project and is under construction the Colorado River in northern Arizona. By June 30, about 10,000 cubic yards had been placed in the dam, which will have otal volume of 4,865,000 cubic yards when it is completed. By

*Night view of Flaming Gorge Dam on Green River in Utah as constructi passes the three-quarter mark.*

the end of the fiscal year, the dam was completed to a height of abo 445 feet above the lowest point in its foundation.

Also at the dam, installation of the four steel river outlet-wor pipes was completed, and installation of the eight steel penstoc to convey water to the turbines of the 900,000-kilowatt Glen Canyo powerplant was essentially completed. Late in the fiscal year, contract was awarded for completion of Glen Canyon powerplan switchyard, dam, and appurtenant works.

## Flaming Gorge

On the Flaming Gorge unit of the Colorado River storage proje on the Green River in Utah, a total of approximately 730,000 cubi yards of concrete had been placed in Flaming Gorge Dam by the en of the fiscal year. When completed, the concrete-arch dam wi have a total volume of 970,000 cubic yards. By June 30, the da stood 342 feet high above its foundation; total height of the structu is to be 502 feet.

Clearing of the reservoir area at the Flaming Gorge site progress rapidly, and as of June 30 was about 96 percent completed in 6 percent of the contract time. The contractor for the completion of the 108,000-kilowatt Flaming Gorge powerplant and switchyard began excavation work on the switchyard extension in April 1962. In June he proceeded with work within the powerplant.

### *Navajo Dam*

Another major feature of the Colorado River storage project, the 408-foot-high earthfill Navajo Dam on the San Juan River in New Mexico, was 96 percent completed by the end of the fiscal year—the first principal storage feature of the project to be completed. The 25-millionth cubic yard of a total of 26,250,000 cubic yards was placed on May 22, 1962. The outlet works and spillway were essentially completed. The diversion tunnel in the dam was closed ate in the fiscal year to permit the start of filling of the 1,709,000-acre-foot reservoir, which will extend a considerable distance into southwestern Colorado.

Construction of the roadbed for the relocation of the Denver & Rio Grande Western Railroad and relocation of county roads around he reservoir were completed in July 1961. Laying track and bal-

***orage begins in Navajo Reservoir on the San Juan River, N. Mex., as avajo Dam nears completion.***

lasting for the railroad relocation was started in April 1962, and w about 75 percent completed by June 30.

A major step forward in the development of the Colorado Riv storage project was the start of construction, in April 1962, of the 34 foot-high, 3-million-cubic-yard earthfill Blue Mesa Dam and 60,0 kilowatt Blue Mesa powerplant on the project's Curecanti unit western Colorado. Construction of Government camp facilit for the dam was started in November 1961. The water supply a sewage disposal systems were completed in April 1962, and the off and laboratory building, warehouse, and garage were nearly complet as of June 30, 1962.

## *Transmission System Advances*

Progress of development of the Colorado River storage proj was highlighted by the advancement of construction of more th 1,000 miles of high-voltage lines which are to be interconnected i vast power grid and will transmit power from the project's pow plants to widespread areas in the Upper Colorado River Ba States.

These lines, in various stages of construction at the end of t fiscal year, were: Glen Canyon-Flagstaff-Pinnacle Peak (Ariz 345-kilovolt, 240 miles; Glen Canyon-Shiprock (Ariz.-N. Mex 230-kilovolt, 182 miles; Curecanti-Craig (Colo.), 230-kilovolt, 1 miles; Cortez-Curecanti (Colo.), 230-kilovolt, 101 miles; Shipro Cortez (N. Mex.-Colo.), 230-kilovolt, 42 miles; Flaming Gor Vernal-Rangely (Utah-Colo.), 138-kilovolt, 85 miles; Rangely-O Creek (Colo.), 115-kilovolt, 115 miles; Blue Mesa-Curecanti, Morr Point-Curecanti, Curecanti-Montrose (Colo.), 115-kilovolt, 39 mil Blue Mesa-Gunnison (Colo.), 115-kilovolt, 22 miles; Kremmli Green Mountain (Colo.), 115-kilovolt, 10 miles; Kremmling-G Tap (Colo.), 69-kilovolt, 8 miles.

## *Participating Projects*

Construction of the participating projects of the Colorado Riv storage project, to develop water for use within the respective Sta of the basin, was noted by the completion of the earthfill Pao Dam on the Paonia project in western Colorado. Following comp tion of the 1,266,000-cubic-yard dam in January 1962, and filli of the 21,000-acre-foot reservoir during the spring runoff, the Pao project was transferred by the Bureau of Reclamation to the No Fork Water Conservancy District. The project is the first parti pating project of the storage project to be turned over to a wa users' organization for operation.

Work advanced on five other participating projects of the storage roject—central Utah project, Utah, Florida and Smith Fork rojects, Colorado, Seedskadee project, Wyoming, and Hammond roject, New Mexico. Construction of 11 miles of the Steinaker ervice canal and laterals on the central Utah project was started in pril 1961, and completion is anticipated early in fiscal year 1963. ehabilitation of farm ditches along the Steinaker feeder canal was egun in October 1961, and completed in January 1962.

Work on the Florida project was initiated in July 1961, with the eginning of construction on the 215-foot-high, 3-million-cubic-yard arthfill Lemon Dam. By the end of the fiscal year, 50 percent f the contract work was completed. Excavation of the outlet-orks tunnel, gate chamber, and access shaft was completed uring the fiscal year and concrete lining was being placed at year's nd. Excavation for the spillway structure was completed and lacement of concrete was begun. Construction of the county road elocation at the damsite was about 2.5 percent completed by June 0, 1962. In May of the same year, clearing of right-of-way for the lorida farmers ditch diversion dam and ditch enlargement and nlargement of the Florida Canal were started.

On the Smith Fork project, placement of embankment for the 160-oot, 855,000-cubic-yard, earthfill Crawford Dam was begun in eptember 1961, after diversion of Iron Creek through the outlet-orks tunnel. Placement of concrete in the outlet works structures nd spillway structure was completed. Placement of dam embank-ent as of June 30, 1962, was about 90 percent completed. Construc-ion of the first section of the Aspen Canal and Smith Fork siphon as begun in June 1961, and was completed in June 1962. Work on he Smith Fork Diversion Dam and the remainder of the Aspen anal was started in August 1961, and was about 90 percent completed y June 30, 1962.

Construction of the Fontenelle Dam on the Seedskadee project egan in July 1961, and was about 30-percent completed by the end f the fiscal year. The dam is an earthfill structure, to be 127 feet igh and have a volume of 5,300,000 cubic yards. The access road t the dam was completed in October 1961. Construction of Govern-ent community facilities at the dam continued throughout the fiscal ear; five contracts for the community facilities were completed, and wo other contracts were in progress at the end of the fiscal year.

Work on the Hammond diversion dam on the Hammond project, ew Mexico, including a part of the main canal, was completed in arch 1962, and the Hammond pumping plant and penstock, bypass, nd discharge lines were virtually completed by June 30, 1962. onstruction of the second section of the Hammond main canal, east highline laterals, and west highline laterals was begun in July 196 and was essentially completed by the end of June 1962.

## *Pacific Northwest*

In the Pacific Northwest, construction on the Wenatchee divisio of the Chief Joseph Dam project, Washington, was noted by compl tion of the river and booster pumping plants. Construction of t 2.4-mile-long discharge pipeline was virtually completed. The ele trical distribution and control line to the plants was essentially co pleted, and the pipelines, pumping plants, and regulating reservoi for Laterals 1 through 10 of the east unit lateral system were abo 97 percent complete at the end of June 30, 1962.

On the Columbia Basin project, also in the State of Washingto construction of irrigation facilities was advanced, bringing to a tot 450,000 acres available for irrigation. Construction of the Ho Valley and Frenchman Hills pumping plants and their discharge lin in the west canal lateral system was completed in November 196 The block 80 lateral system, also in the west canal lateral syste was completed in December 1961. Three contracts for enlargeme of the Potholes Canal were started during the winter and complete during the nonirrigation season. Construction of block 23 lateral and wasteways for the Wahluke Branch canal laterals was started i January 1962, and is scheduled to be completed by April 1963. Wor was started in May 1962 on additions to the White Bluffs pumpin plant No. 2 and construction of the switchyard.

Construction of the Ochoco relift and Barnes Butte pumping plant on the Crooked River project in Oregon was completed in Septembe 1961, and the Lytle Creek diversion dam and wasteway were com pleted in February 1962.

A new start of the fiscal year was the 104-foot-high, 1,025,000 cubic-yard, earthfill Bully Creek Dam and feeder canal on the Val project in Oregon. The work was started late in the fiscal year an is scheduled to be completed by May 1964.

## *California*

Reclamation construction in California was noted by the completio of the 11-mile-long Clear Creek Tunnel on the Trinity River divisio of the Central Valley project after 5 years of intensive constructio activity. Clearing of the Trinity Reservoir area was completed i December 1961. Relocation of the last section of Trinity Count roads around the reservoir was completed in May and construction o a final link from the dam to the road system was about 50 percent complete by the end of the fiscal year.

*ater from the Trinity River in northern California will pass through pen-*
*cks of the Clear Creek powerplant on its way to California's Central Valley.*

Construction advanced on the Trinity River division's three large
werplants—Trinity, Clear Creek, and Spring Creek powerplants.
nstruction of the Trinity powerplant (100,000 kilowatts) structure
d penstocks was completed in December 1961, and the contractor
installation of the turbines and completion of the powerplant
gan work in January 1962. At the time work was shut down by
ike, the first week in May 1962, tunnel 2 of the Spring Creek con-

duit was almost completely lined, and steel lining and concrete casement were about two-thirds completed for the Rock Cre siphon.

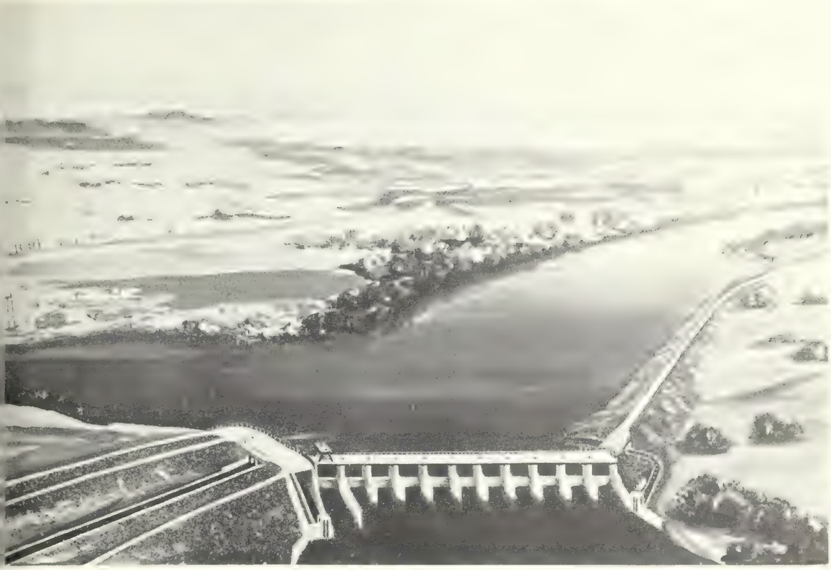
Construction of the Clear Creek powerplant (134,000 kilowat structure was completed in December 1961, and the contractor installation of the turbines and completion of the powerplant beg work the first week in January 1962. The Spring Creek powerpla (150,000 kilowatts) structure was completed, and the completi contractor was permitted to start installation of the turbines in Mar 1962. Installation of the Spring Creek penstocks was completed May 1962, and only minor work remained unfinished when the wo was shut down by strike early in May.

Also on the Trinity River division, construction of the Whiskeyto Dam was 67 percent completed by June 30, 1962. The earth structure will be 270 feet high and have a volume of 4,463,000 cub yards. The flow of Clear Creek was diverted through the out works for the dam during November 1961; subsequent work w stopped by a strike early in May. Clearing of the Whiskeyto Reservoir area was about 75 percent complete by the end of Ju

The embankment for the Trinity River division's earthfill Lewist Dam (height, 80 feet; volume, 429,000 cubic yards) was largely co pleted. The spillway structure was about 35 percent complete Concrete placement in the outlet works and powerplant structures w substantially completed when work was suspended by a strike ear in May. Clearing of the Lewiston Reservoir site was complet in October 1961. Construction of the Trinity River Fish Hatche adjacent to the Lewiston Dam was about 60 percent complet at the end of June 1962; work continued on various concrete structur erection of buildings, and installation of pipelines and equipme

Construction of the 190-foot-high, 1,866,000-cubic-yard earth Spring Creek Dam and its tailrace into the existing Keswick Reserv was started in July 1961. The flow of Spring Creek was divert through the outlet works in April 1962, and full-scale embankme work was in progress for 2 weeks until stopped by strike in May 196 The work was 33 percent complete at that time.

A contract for additions to the 230-kilovolt Keswick switchya to tie in the powerplants of the Trinity River division was about percent complete by the end of June 1962. Construction of the 2 mile, 230-kilovolt transmission line to tie Trinity, Clear Creek, a Spring Creek powerplants into the Keswick switchyard was about percent complete at the end of June, and is to be completed by Dece ber 1962. A 22-mile-long section of the Keswick-Gas Point Roa Cottonwood 230-kilovolt transmission line was started in January 19 and was 25 percent complete by the end of June. Construction of t



*ed Bluff Diversion Dam, now under construction on the Sacramento River part of the Central Valley project, California—artist's conception.*

as Point Road-Elverta, Elverta-Hedge, and Hedge-Tracy 230-lovolt transmission lines, totaling 222 miles in length, was started in pril 1962, and was about 5 percent completed by the end of June.

## entral Valley

On the American River division of the Central Valley project, e first section of pipelines, structures, and reservoirs for the El orado distribution system was completed in March 1962; work on e second section was started in November 1961, and was about 30 rcent complete by the end of June 1962. Work on a contract for iamond Springs main, feeder line, and laterals was started in Janry 1962, and was about 15 percent completed by the end of June; additional contract was awarded at the end of April. At the end the fiscal year, chlorination and water-treatment facilities were mpleted at several reservoirs of the system.

Construction of pipelines and pumping plants for the Stone Corral rigation District of the Friant-Kern Canal distribution system on e Central Valley project was completed in March 1962. The part 1 tensions for the Madera distribution system were completed in nuary 1962, and the part 2 extensions were completed in June.

An important new start on the Central Valley project's Sacramento iver division was the Red Bluff diversion dam, begun in March 1962.

Construction of the dam was shut down by strike early in May; t dam was about 10 percent completed.

Also in California, work on the Prosser Creek Dam of the Wash project was about 85 percent completed by the end of the fiscal ye The dam is an earthfill structure and is to have a height of 157 feet a a volume of 1,738,000 cubic yards.

## *Nevada*

The Bureau's progress in development of hydroelectric pow resources was underscored at the Hoover powerplant on the Bould Canyon project, Arizona-Nevada.

Installation of the 95,000-kilowatt generating unit N–8 in t Nevada wing of the powerplant was completed and the unit plac in service November 30, 1961, bringing the plant to its full generati capacity of 1,344,800 kilowatts.

## *Colorado*

On the Collbran project in western Colorado, construction of t Upper and Lower Molina powerplant structures, penstocks, and equa izing reservoirs was completed in October 1961. Construction of t Upper Molina-Lower Molina 115-kilovolt transmission line, the Upp Molina equalizing reservoir, and Bonham-Cottonwood 12.47-kilovo joint power and telephone lines was completed in November 196 Completion work on the Upper and Lower Molina powerplants a switchyards was virtually completed by the end of the fiscal yea

The contract for the East Fork diversion dam, East Fork feed canal, and rehabilitation of Bonham Dam was begun in July 196 and as of June 30, 1962, was about 76 percent completed. Bonha Dam was essentially completed and the dam restored to service befo work was closed down for the 1961–62 winter. Work on the diversi dam and feeder canal is to be completed during fiscal year 196

## *Utah*

In Utah, construction progress on the Weber Basin project w marked by the virtual completion of the second stage of constructi of the earthfill Willard Dam and by the award of the contract late the fiscal year for the third and final stage of construction. When co pleted, the dam will have a total volume of 13 million cubic yards a will be more than 14 miles long—the Bureau's longest dam. Co struction is to begin early in fiscal year 1963 on another project earth structure, Causey Dam, which will be 200 feet high and have a volum of 1,400,000 cubic yards.

Construction of the Willard Canal pumping plants Nos. 1 and 2 vas begun in August 1961, and as of June 30, 1962, the work was pproximately 50 percent completed. Earthwork on the Willard anal and intake channel was nearly completed by the end of June, nd placement of concrete in both pumping plants was in progress at hat time. Construction of the first stage (6 miles) of the Willard anal was completed in March 1962. Construction of the final stage 8 miles) of the canal is scheduled to begin early in fiscal year 1963. ipeline and reservoir construction for the North Davis laterals, nit 1, was completed in August 1961. Construction work on the orth Davis laterals, unit 2A, was begun in June 1961, and as of une 30, 1962, was approximately 60 percent completed. Construcion of the North Davis laterals, unit 2B, was begun in July 1961, nd as of June 30, 1962, was approximately 85 percent completed. onstruction work on the West Farmington lateral system was comleted in September 1961. Pipelines and structures for the Woods ross laterals, part 2, were placed under construction in March 1962, nd as of June 30, 1962, were approximately 30 percent completed.

## *Texas*

An important undertaking in Texas was the start of construction n February 1962, on the Sanford Dam on the Canadian River project n the northwestern part of the State. This earthfill structure will be 28 feet high and have a volume of 14,800,000 cubic yards. Placement f the dam embankment began in May, and by June 30 about 7 ercent of the work had been accomplished.

Also in Texas, work on the 134-foot-high, earthfill Twin Buttes Dam f the San Angelo project was about 93 percent completed in 68 ercent of the contract time as of June 30, 1962. Approximately 18 nillion cubic yards of embankment of the required 21 million cubic ards had been placed. Placement of concrete in the outlet works and pillway was essentially completed. Clearing of the Twin Buttes eservoir site was completed in March 1962. Construction of earthvork, concrete lining, and structures for the San Angelo main canal vas begun in June 1961, and was about 90 percent completed by une 30, 1962. All canal excavation has been completed and placenent of concrete canal lining progressed at the fiscal year's end. n October 1961, work was begun on the earthwork, concrete lining, nd structures for the San Angelo distribution system. Approxinately 75 percent of the work had been accomplished by the end of une.

## *Oklahoma and Kansas*

In Oklahoma, on the Washita Basin project, construction of eart work, concrete and steel pipe, and structures for the 38-mile-long Fo aqueduct and 13 miles of the Clinton, Bessie, and Cordell laterals w completed in June 1962. Work on Foss pumping plants Nos. 1, and 3, and the erection of three steel water tanks for Foss aquedu were also completed in June. Construction of recreational faciliti for the Foss Reservoir was completed in October 1961.

In Kansas, a major new undertaking was start of construction the earthfill Cheney Dam on the Wichita project. When complete the dam will be 86 feet high and have a volume of 7,900,000 cub yards. Work on the dam was about 5 percent completed by the er of June 1962.

## *Missouri River Basin*

In Montana, on the Missouri River basin project, constructio advanced on the 520-foot-high, concrete-arch Yellowtail Dam, large concrete dam to be undertaken thus far by the Bureau of Reclamatio on the farflung project. By the end of the fiscal year, construction the dam and the 200,000-kilowatt Yellowtail powerplant at the toe the dam was about 18 percent completed. The diversion tunnel wa "holed through" in March 1962, and placement of concrete lining wa started in May. Excavation of the inclined portion of the spillwa tunnel and erection of the contractor's concrete and aggregate plan continued. Eight contracts were completed during the fiscal year fo construction of community facilities for the Yellowtail Dam Govern ment camp.

On the East Bench unit of the Missouri River basin project, also i Montana, relocation of 15.2 miles of the Union Pacific Railroad fo Clark Canyon Reservoir was essentially completed by June 30, 196 Construction of the 158-foot-high, 1,845,000-cubic-yard, earthfi Clark Canyon Dam was begun in November 1961, and by June 3 1962, about 15 percent of the work had been completed. In Octobe 1961, construction of the Barretts diversion dam and the first sectio of the East Bench canal and laterals was begun. By the end of th fiscal year, about 45 percent of the work had been accomplished. Wor on the second section of the East Bench canal and laterals was starte in June 1962.

## *Frenchman-Cambridge*

Construction on the project's Frenchman-Cambridge division i Nebraska was highlighted by the completion in February 1962 of th

Red Willow Dam, an earthfill structure 127 feet high and having a volume of 3 million cubic yards. Final clearing of Red Willow Reservoir was completed in April 1962. Also completed was the second section of the Culbertson extension canal and lateral system. Earthwork and structures on the Cambridge subsurface drains were completed in September 1961. In January 1962, construction was begun on the Red Willow canal and lateral system, and by June 30 the work was about 40 percent completed. In April 1962, the contractor started clearing and stripping for the Red Willow diversion dam, including a short section of the Red Willow Canal.

On the project's Farwell unit, also in Nebraska, construction of Sherman Dam was completed in January 1962. The earthfill dam has a height of 130 feet and a volume of 1,748,000 cubic yards. Work on the Arcadia diversion dam, including a short reach of the Sherman feeder canal, was completed in June 1962. The remainder of the Sherman feeder canal was about 95 percent completed by the end of June 1962. Work on the concrete highway bridge and 10 county road bridges along the Sherman feeder canal was completed in December 1961. Construction of earthwork, surfacing, and a concrete bridge for the relocation of a secondary road at Sherman Reservoir was completed in November 1961. Construction of the Farwell main canal and laterals, Farwell central canal, and Farwell lower main canal and laterals progressed under three contracts. As of June 30, one contract was about 80 percent completed, another contract was about 50 percent completed, and the third contract was about 5 percent completed.

## *Merritt Dam*

Construction of Merritt Dam and access road on the Ainsworth unit of the Missouri River basin project, in Nebraska, was about 40 percent completed as of June 30, 1962. Work on the access road was essentially completed. In April 1962, construction of earthwork, concrete lining, and structures for section No. 1 of the Ainsworth Canal was begun and by the end of June was approximately 20 percent completed. Construction of earthwork, concrete lining, and structures for section No. 2 of the canal was begun in June 1962.

On the project's Cedar Bluff unit, in Kansas, work on the canal outlet works for Cedar Bluff Dam was completed in August 1961. Construction of the first section of the Cedar Bluff Canal was completed in April 1962, and work on the second section of the canal was substantially completed by the end of June 1962. Work on the third section of the canal, including a lateral system, wasteway, and drains, was begun in June 1962.

Construction on the project's Kirwin unit, also in Kansas, was not by completion of earth lining in selected reaches of the existing Kirw Canal in December 1961. In April 1962, work was begun on t placement of earth lining in existing reaches of the Kirwin mai Kirwin north, and the Kirwin south canals. By the end of Jun about 40 percent of the work had been accomplished. Constructi of earthwork and structures for the Osborne lateral and drains beg in April 1962, and was about 40 percent completed by June 30.

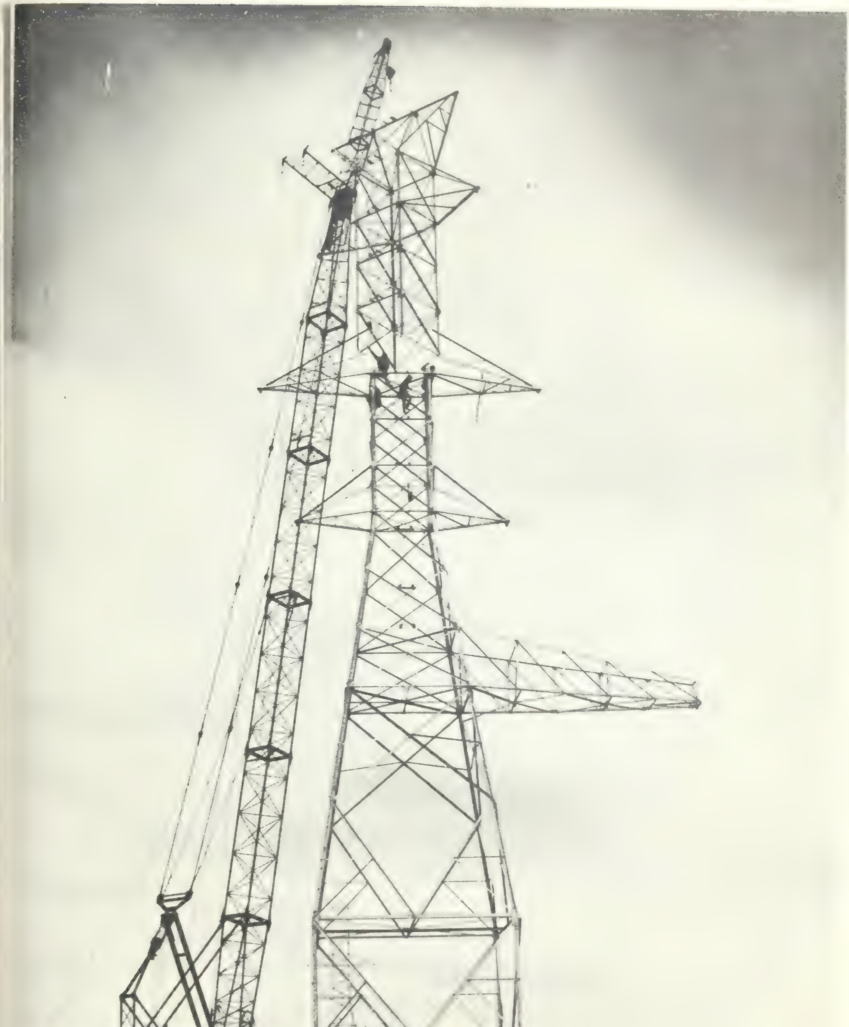
In November 1961, first major work was begun on the Almena un of the Missouri River basin project in Kansas—the relocation of 13 miles of the Chicago, Rock Island & Pacific Railroad, and connectio to the Chicago, Burlington & Quincy Railroad for Norton Dam. A of June 30, 1962, the work was about 50 percent completed. Co struction of the unit's principal feature, Norton Dam, is expected begin early in fiscal year 1963. The earthfill structure will have height of about 100 feet and a volume of about 3 million cubic yard

## *Missouri River Basin Transmission System*

The fiscal year was outstanding for the considerable progress mad in the construction of high-voltage transmission lines, substation and related electrical facilities for the transmission division of th Missouri River basin project. The lines completed or under co struction spanned varying distances in the States of Montana, Nort and South Dakota, Iowa, Minnesota, Wyoming, and Nebraska.

In Montana, construction of foundations and erection of ste towers for the 160-mile Dawson County-Custer section of the Yellow tail-Dawson County 230-kilovolt line began late in the fiscal yea In North Dakota, construction of foundations and erection of ste towers for the 84-mile Jamestown-Fargo 230-kilovolt transmissio line No. 2 were completed in November 1961. Stringing of conducto and overhead ground wires was begun in September 1961, and completed in April 1962. Construction of foundations and erection c steel towers for the 136-mile Garrison-Jamestown 230-kilovolt lin also in North Dakota, were completed in February 1962. Stringin of conductors and overhead ground wires was begun in June 196 Construction of the 114-mile Garrison-Minot-Rugby 115-kilovolt lin in the same State was completed in August 1961, and construction c 11 miles of the Jamestown-Grand Forks 115-kilovolt transmission lin No. 1 was completed in September 1961.

In South Dakota, construction of foundations and erection c steel towers for the 57-mile Oahe-Fort Thompson 230-kilovolt lin were completed in December 1961. Stringing of conductors an overhead ground wires for the Oahe-Fort Thompson line, the switc yard approaches, and 1.42 miles of the Oahe-Midland line was begu



*Erecting a triple circuit transmission tower in North Dakota adds another egment to the transmission system of the Missouri River basin project.*

in September 1961, and by the end of June 1962, the work was essentially completed. Stringing of conductors for the second circuit additions for 337 miles of the Fort Thompson-Huron Watertown (S. Dak.), Fort Randall (S. Dak.)-Sioux City (Iowa), and Fort Randall-Fort Thompson 230-kilovolt transmission lines neared completion by the end of the fiscal year. Construction of 213 miles of the Sioux City-Spencer and Sioux City-Denison-Creston 161-kilovolt transmission lines (all in Iowa) also neared completion by the end of June 1962.

In August 1961, stringing of conductors for the second-circuit additions for 74 miles of the Watertown (S. Dak.)-Granite Falls (Minn.) 230-kilovolt line was started, and all work was completed by March 1962. Construction of the 88-mile Rapid City-Newell-Maurine 115-kilovolt line in South Dakota was begun in January 1962, and as of June 30, 1962, about 80 percent of the work was completed. Construction of the 75-mile Oahe-Eagle Butte 115-kilovolt line, also in South Dakota, was begun in March 1962, and was approximately 80 percent completed by the end of June 1962. Contracts for construction of the 65-mile Eagle Butte-Maurine 115-kilovolt transmission line and for construction of the 95-mile Winner-Mission-Martin 115-kilovolt transmission line, both in South Dakota, were awarded late in the fiscal year. Construction of the 65-mile Pine Bluffs-Sidney 115-kilovolt transmission line (Wyoming-Nebraska) was completed in October 1961.

## *Safety Program*

The Bureau of Reclamation's concerted effort to carry out a vigorous and effective safety program was emphasized in fiscal year 1962 by the fact that the lost-time accident frequency rate of 7.6 by Government forces during the year represented a 21 percent improvement over the previous year. This was the lowest accident rate in Reclamation history. Time lost due to accidents was also the lowest in recorded Bureau accident history. This resulted in a reduction of $215,000 in injury costs as compared with the previous fiscal year. Contractors on Reclamation projects reduced their accident frequency rate to 24.1, the lowest recorded for contractors on Reclamation projects. There was also a marked reduction in the number of fatalities among contractor forces as compared with the previous fiscal year.

Increased emphasis was placed on public safety to provide maximum protection to the public visiting Reclamation installations or exposed to the hazard of drowning in canals, laterals, and reservoirs. All Bureau properties were surveyed to assure compliance with safety standards for protection of the public. More than 1,000 field supervisors received first aid instruction under a cooperative agreement with the Bureau of Mines. The Bureau of Reclamation became a member of the National Safety Council's fleet safety program to lower vehicle accidents and to provide driver participation in a nationally recognized safe-driver-award program.

## *Major Contracts Awarded*

Table 1 lists the major contracts (more than $1,000,000) awarded by the Bureau of Reclamation in fiscal year 1962. The largest—$17,868,160—was for construction of the Sanford Dam on the Canadian River project in Texas.

Other major features for which contracts were awarded were the Blue Mesa Dam and powerplant on the Curecanti unit of the Colorado River storage project in Colorado, the 240-mile-long Glen Canyon-Flagstaff-Pinnacle Peak transmission line, Colorado River storage project in Arizona, the Gas Point Road-Elverta, Elverta-Hedge, and Hedge-Tracy transmission lines, totaling 222 miles, on the Central Valley project in California, and the completion of Glen Canyon powerplant, switchyard, dam, and appurtenant works on the Colorado River storage project, in Arizona.

Listed in table 2 are the principal features completed on Bureau of Reclamation projects in fiscal year 1962. The table includes three storage dams, two diversion dams, a major tunnel (Clear Creek), 335 miles of canals, pipelines, laterals, and drains, and 375 miles of transmission lines.

## *Engineering Design*

Design schedules were met efficiently and promptly by improved design techniques and greater utilization of automatic computing devices in design analysis. Specifications for 89 construction contracts and 82 major supply contracts were completed during the fiscal year. More than 4,500 new drawings were prepared and over 1,500 "as-built" drawings were revised.

To obtain valuable data for use in design and selection of high-voltage transmission line towers for the unusual and extreme weather and foundation conditions encountered in the West, the Bureau awarded contracts for fabrication and testing of a variety of experimental transmission line towers. The towers are to be installed in a 7-mile section of the 182-mile-long, 230-kilovolt transmission line extending from the Glen Canyon powerplant to Shiprock, N. Mex. In this assessment of whether improved types of structurally sound towers can be developed for easier and more economical installation. the Bureau is particularly interested in developing lightweight towers that can be transported by helicopters to rugged and inaccessible areas and installed by helicopters.

## *Use of Computers*

Significant progress was made in the application of electronic computers to engineering analyses and problems, leading to increased efficiency and economy in design work. A new electronic computer installed in the Bureau's engineering offices in Denver was used from 250 to 300 hours per month for calculations on engineering and scientific problems. New programs for electronic computer application were developed to solve, among others, the following major engineering problems: structural design analyses of slabs and two-dimensiona frames; computation of earthwork quantities for canals, laterals, and pipe trenches; statistical analyses of field test data from earth and concrete dams; design of concrete-arch dams; determination of power flows in interconnected high-voltage electrical power systems; and analyses of hydrologic systems. The machine was also used to speed up calculations of earthwork quantities for highways and to aid in design studies of powerplants, pumping plants, spillways, and other structures.

To meet the many important responsibilities of the Bureau in carrying out its present and future water resource development programs more economically and expeditiously, an intensive study was made o the possible application of automatic data processing techniques to planning, design, irrigation and power operations, construction, and research activities. In inventorying the needs to strengthen and streamline the Bureau's technical effort through automatic data processing methods, a wide variety of problems were evaluated for potential solution by electronic computers. Among the more complex problems assessed for automatic machine analysis were coordinated operation of river, reservoir, and hydroelectric power systems on a basin and interbasin basis, project formulation studies, and optimization o project design.

## *Studies Aim at Economies*

To effect economies in pipelines, design studies were made on the use of high-strength, deformed steel reinforcing bars in precast concrete pipe. As a result of these studies, a contract was awarded to perform hydrostatic and dynamic tests on full-size test specimens If the tests confirm design analyses, considerable savings will be realized in future pipelines of medium to large size. Standardization of designs of canal structures was extended during the fiscal year by the completion of standard designs for monolithic concrete closed conduits in sizes 96 through 144 inches in diameter.

Under study during the fiscal year was the bold new design for an extremely large generator having a capacity of about 300,000 kilowatts. The design study was undertaken, with cooperation from industry, to meet the anticipated requirements of new Reclamation developments where extremely large generating units would be most efficient and economical. Also under intensive study was extra-high (from about 400 to 800 kilovolts) voltage transmission of electrical power. The studies were directed toward both increased voltages for alternating current transmission and possible utilization of extra-high direct current for interties between large power producing areas and to large load centers.

Considerable savings in both operation and maintenance of pumping plant installations are to be realized by a new insulation system for pump motors developed by Bureau electrical designers. Use of the new insulation will obviate difficulties experienced by the absorption of moisture by previous pump motor insulations and the need for heaters which earlier had added considerable expense to operation of pumping plants.

A novel development having widespread potential application and holding promise of reducing costs was the design of a power device which utilizes the effect of the electrostatic field surrounding high-voltage transmission lines (230-kilovolt or higher). The device has sufficient continuous capacity to supply airway obstruction lighting on high towers, supply power service for lighting and operating small power tools, and energize remote communication facilities such as radio or microwave repeater stations.

The Bureau's program of modifying existing powerplants to provide for semiautomatic and centralized control devices and instruments progressed during the fiscal year to the extent that substantial savings in operating expenses are being achieved. Closed-circuit television was utilized for remote surveillance of powerplants and for security precautions at certain plants.

In mechanical design, a new 10-inch jet-flow gate was designed and fabricated for the outlet works at Whiskeytown Dam on the Central Valley project, California. The gate provides an economical, erosion-free regulation of small discharges. A new welded truss design was developed for the 60- by 18-foot fixed-wheel gates at Red Bluff Dam, resulting in a weight savings of about 17 percent, or about 150,000 pounds, for the 11 gates. In addition, serious downpull and hoisting problems were eliminated, and simpler field installation and maintenance were provided.

## *Miniature TV Utilized*

Bureau geologists initiated procurement of a television borehole telescope to view the inside of dam foundation drill holes and to evaluate in-place geologic conditions. The television device can be inserted in the small-diameter (3-inch) drill holes commonly used in Bureau foundation exploration and thus provide data which cannot be obtained by any means other than expensive large-diameter drill holes or exploration shafts. The television borehole telescope will be used initially in investigations at the Morrow Point damsite in Colorado—the first application of the device to small-size drill holes in dam foundation exploration in the United States.

## *Engineering Reference Office Created*

To keep abreast of the vastly expanding scientific and engineering writings in water resources development, the Bureau established during the fiscal year an Office of Engineering Reference. The Office, through information storage and retrieval methods, will aid Reclamation engineers and scientists in keeping informed of the technical literature relating to their work. The Office will be an important link in a developing national science information network.

## *Construction Awards and Costs*

A total of 29 contracts, principally for electrical equipment, was awarded to companies offering foreign manufactured equipment or materials. These contracts, which totaled $952,261, included those with eight Canadian, five West German, four South American, three English, two Japanese, two Italian, two Dutch, and one each with Austrian, Swedish, and Swiss firms. Twenty of the contracts were for electrical items; four were for electronic distance measuring instruments; two were for theodolites; two were for an evaporative retardant mixture; and one was for hoists. In accordance with regulations of the Department of the Interior, a differential was added to each bid offering foreign equipment or materials for comparison with domestic bids.

Construction costs on Bureau of Reclamation projects increased about 1½ percent during fiscal year 1962. For the same period, construction wage rates increased about 4 percent, while most construction material costs remained fairly stable.

Bidding interest in Reclamation construction work averaged 6.6 bids per schedule, which was essentially the same as for the preceding fiscal year. This compares with an overall average of 6.3 bids per schedule for the past 10 years.

The total of all low bids received for construction schedules was about 97 percent of the total for the engineers' estimates. The average of the three low bids for each schedule was about 103 percent of the engineers' estimates.

Table 3 shows cost indexes for Bureau of Reclamation construction work based on the combined costs of materials and labor supplied by the contractor, and materials and labor supplied by the Government.

### *Publications*

Published during the fiscal year were the Technical Records of Design and Construction for Tiber Dam, Glendo Dam and Powerplant, and the Talent Division of the Rogue River Basin Project. Also published was the second edition of the Paint Manual, a practical reference work describing procedures for the control and application of paints and other protective coatings to structures.

Issued also were an engineering monograph on calculation of stress from strain in concrete and two technical memoranda covering simplified analytical solutions of transmission system problems and predicting return flow from irrigation. More than 250 laboratory reports were issued, embracing the subjects of research and testing of materials for concrete, hydraulic laboratory studies, earth materials investigations, research in bituminous materials, studies of weed control, and protective coatings investigations.

In response to 6,500 requests for the Bureau's publications and informational materials received from individuals in this country and in foreign countries, 33,000 copies of technical publications and informational pamphlets were sold or distributed. Sales of Bureau publications totaled $37,500. About one-half of the total sales was made to foreign countries. Publications sold for the Superintendent of Documents, as his agent, totaled more than $15,000.

## *Research Program*

The Bureau's program of research continued to move forward in investigating new and economical methods and materials for use on Reclamation water resource developments.

Indicative of this intensive research effort was the undertaking early in 1962 of a program of weather modification research in cooperation with the National Science Foundation and the U.S. Weather Bureau. Contracts were awarded to three universities for research in support of the program, the long-range objective of which is to increase water supply on Reclamation projects through artificially induced precipitation. The Bureau's immediate goal is to investigate, in cooperation with the universities and other research organizations, the mechanism of water transport by air masses and the inducement of precipitation from the air masses. The contracts are with the Natural Resources Research Institute, University of Wyoming; the Institute of Atmospheric Sciences, South Dakota School of Mines and Technology; and the Desert Research Institute, University of Nevada.

The Natural Resources Research Institute is conducting laboratory and field research on new methods and instruments for observing and studying meteorological conditions in Wyoming and South Dakota. The Institute of Atmospheric Sciences is performing research and classifying the ways that air masses in the Great Plains area transport water at different times of the year. The emphasis of this study is on meteorological conditions in South Dakota. The research also includes the investigation of materials and techniques for inducing precipitation from suitable moisture-bearing air masses. The Desert Research Institute is investigating methods of evaluating cloud-seeding experiments.

*Fishing, camping, water skiing—Lake Mohave, Ariz.*

## Reservoir Evaporation Reduction

The fiscal year was noted by the advances made in the Bureau's -year research program in reservoir evaporation reduction, scheduled o continue through 1964. The goal is to develop practical evaporaion-reduction techniques that can be used economically on storage eservoirs. The research effort was directed toward the improvement f the technique of placing a 1-molecule-thick chemical layer (monoyer)—about six ten-millionths of an inch—on reservoir surfaces as n evaporation retardant. The monolayer-forming materials under tudy are a mixture of hexadecanol and octadecanol, known as fatty lcohols. The compounds are tasteless, colorless, and harmless to umans, as well as to plants, animals, fish, and other wildlife.

In pursuing this research program, Bureau researchers carried out xhaustive tests in 1961, by applying 60,000 pounds of the chemical yer to the surface of the 3,090-acre Lake Cachuma during the hot ummer months when evaporation was greatest. The reservoir is feature of the Cachuma project in California.

Further steps in the research program were initiated by Utah tate University under a contract with the Bureau of Reclamation. n the summer of 1961, the university began studies of the physical nd economic feasibility of applying evaporation-retarding chemicals y low-flying aircraft. The university's research program, which is continue through June 1963, seeks to develop equipment for aerial pplication of monolayer-forming materials, determine flight condiions favorable to aerial spraying of monolayers on water surfaces, vestigate the economics of aerial application, study the behavior aerially applied monolayers, and to work toward development of itable techniques and equipment for field tests on a reservoir of pproximately 5,000 acres.

## ow-Cost Canal Linings

The Bureau intensified its research in low-cost canal lining developent by testing in July 1961, a new type of chemical sealant to reduce epage of valuable irrigation water along a 6.6-mile reach of a lateral the Eden project in Wyoming. The sealant used in the test was petroleum-based emulsion which was carried into the soil of the ottom and side slopes of the water-filled lateral. Eventually, the il voids were filled to form a barrier or membrane to water seepage elow the soil surface. Measurements taken 24 hours after treatent showed a reduction in seepage losses of 55 percent, and, 48 ours after treatment, the reduction was 66 percent. Determination service life of the sealant is being studied.

*Engineers test wax emulsion sealant to reduce seepage loss from irrigatior canal, Eden project, Wyoming.*

A further research effort to reduce canal seepage losses was undertaken early in 1962, on a 1½-mile section of irrigation lateral on the Tucumcari project in New Mexico. The lateral was lined with buried plastic membrane to control severe seepage. The plastic one one-hundredth of an inch thick, was placed in sheets, with 1-foot overlaps. For installation, a few inches of earth were removed from the lateral section, the plastic laid, and then a blanket of earth wa placed over the plastic. In this way, the rehabilitated lateral will retain its original size and capacity.

In October 1961, two laterals on the Columbia Basin project in Washington were treated with a petroleum-based emulsion soil sealant to reduce water loss caused by seepage. At the time of treatment, seepage loss measurements were made to evaluate the effectiveness of the sealant. The tests showed reductions in seepage ranging from 44 to 82 percent immediately after treatment. Similar tests using petroleum-based emulsion sealants were initiated on laterals on Reclamation projects in California, Oregon, and South Dakota. The effectiveness of the sealants to reduce seepage is under continuing study.

## *Soil-Cement Facings*

The fiscal year marked the 10th anniversary of the Bureau's program of study of the experimental soil-cement facing placed in 1951 on a test earth embankment adjacent to the Bonny Reservoir on the Missouri River basin project in eastern Colorado. The results of the study, after 10 years of periodic observations, indicated that soil-cement, properly designed and constructed, is competitive in cost and performance with rock riprap used to protect the upstream faces of earth dams against wave action of reservoirs.

As a result of the Bonny tests, soil-cement is being used as a substitute for rock riprap at Merritt Dam in Nebraska, where suitable rock for riprap is not locally available, and at the Cheney Dam in Kansas.

## *Subsidence Tests*

To evaluate the expected rate of subsidence along critical reaches of the proposed San Luis Canal on the Central Valley project in California, Bureau researchers, late in 1961, began land subsidence tests along the canal line. The tests will provide basic data for estimating how much subsidence will occur when the soils of the area are wetted by irrigation water from the canal. Loose, highly porous soils of low density, which are known to subside with wetting, are found along some 20 miles of the 107-mile canal bed. Land subsidence in the area is a serious problem in the construction of irrigation canals, pipelines, and other engineering features which must stay on grade. At the conclusion of the tests, the Bureau will be better able to estimate how much time and water will be needed to compact the soils and avoid further sinking after the canal is in use.

## *Laboratory Investigations*

Bureau laboratory investigators developed during the fiscal year hydraulic-type pressure cell which shows considerable promise as a instrument for accurately determining earth pressures against rigi structures. A research program is in progress using this type of ce to evaluate pressures around pipes for many field-simulated cond tions of bedding, backfill, and loadings. The findings of this stud are expected to yield data for the improvement of design criteria fc pipes and pipe systems and to lead to lower cost in pipe constructio

The application of radioisotope techniques to measure discharge in canals, streams, and closed conduits was under continuing stud during the fiscal year. The techniques developed are expected t provide a simple and accurate method of measurement unaffected b the configuration of the canal prism or velocity of the flowing wate Devices employing radioisotopes to measure moisture content an density of soils were also under study to determine the suitability c such apparatus for subsurface exploration and construction contrc purposes.

Laboratory researchers continued their investigations to determin suitable applications and effectiveness of various plastics, silicone epoxy resins, and other protective coatings for use in constructio and maintenance of Reclamation structures. Various materials wer investigated for possible application in concrete repairs and surfac treatment to prevent deterioration from abrasion, freezing and thawing, and other weathering and erosion forces.

Investigations of concrete mixes were conducted to determine th effect of maximum size aggregate (sand and gravel) on compressiv strength. The study indicated that it may be more economical t use smaller size aggregates depending upon the compressive strengt desired. Progressively higher strengths were obtained with minimu cement content by the use of progressively smaller aggregates.

Measurements carried out in the Hydraulic Laboratory indicate that design procedures which are used successfully to compute th capacity of small and medium size canals are not adequate for larg concrete-lined canals built on comparatively flat grades. Hydrauli losses in these canals are greater than had been anticipated. Bot laboratory and field investigations were undertaken to acquire dat to provide a firm basis for refinement of design procedures.

Research in weed control continued to place emphasis on aquati weeds in large irrigation canals. By conducting tests under controlle conditions, Laboratory scientists continued to expand their knowledg about the response of aquatic weeds to herbicidal applications unde varying light intensity, light quality, and water temperature. Studie vith antifouling paints for preventing the attachment of algae to rrigation structures indicated that the vinyl-base, high cuprous oxide ontent type of material to be an effective and durable coating for his purpose.

# *Project Development*

The Bureau of Reclamation's project development program involves reparation of comprehensive plans for development of river basin esources and the investigation and planning of potential projects o meet the requirements of the fast growing population of the West or optimum utilization and conservation of its limited water resources. he program also includes detailed preconstruction studies on newly uthorized projects.

The initial stage of the San Juan-Chama project and the Navajo ndian irrigation project were authorized for construction by the act f June 13, 1962, Public Law 87–483.

## *omprehensive Basin Surveys*

During the fiscal year, the Bureau, in cooperation with other gencies, was engaged in comprehensive surveys in 12 river basins roughout the West, including 2 subbasins of the Missouri River asin.

The Bureau and the Corps of Engineers completed a joint report n the Upper Snake River basin, Oregon-Idaho-Wyoming, which has een released to the public. Miscellaneous minor items of investiga- on in connection with other river basin surveys were also active.

## *roject Planning Reports*

By the end of the fiscal year, project planning reports had been ubmitted to the Congress on the Waurika project in Oklahoma; olumbus Bend project in Texas; Arbuckle project in Oklahoma; he Auburn-Folsom south unit of the Central Valley project in alifornia; Savery-Pothook project in Colorado-Wyoming; the Crooked iver project extension in Oregon; and the upper division of the aker project in Oregon.

Planning reports on the Buttes Dam and Reservoir, Middle Gila iver project in Arizona, the Bostwick Park project in Colorado, and he North Loup division of the Missouri River basin project in ebraska were transmitted to the Bureau of the Budget for advice s to their relationship to the President's program prior to submission the Congress.

Planning reports on the Dixie project in Utah and on the Fruitland Mesa project in Colorado were under review by States and Federal agencies prior to submission to the Bureau of the Budget.

## *Definite Plans*

During the fiscal year definite plan reports for authorized projects were completed on the Bully Creek extension of the Vale project in Oregon; the Silt project in Colorado and the Emery County project in Utah, both participating projects of the Colorado River storage project; the Norman project in Oklahoma; the Malaga Bend unit of the MacMillan-Delta project in New Mexico; the Glen Elder unit of the Missouri River basin project in Kansas; the South Gila Valley unit of the Gila project in Arizona; and the James diversion dam, Oahe unit, of the Missouri River basin project in South Dakota.

Review also has been completed by interested Federal agencies and the State of Alaska on the planning report for the Devil Canyon project. In connection with the report on the Crater-Long Lakes division of the Snettisham project, a plan for development by stages was adopted and submitted to the Congress for consideration.

## *Loan Program*

The loan program continued very active, with a sharp increase in the number of applications received. Eight applications totaling $15,726,100 for new small projects and two applications totaling $974,000 for increases in small project loans previously made were approved. Four applications for new distribution system loans totaling $45,232,800, and one for an increase of $600,000 in a distribution system loan previously made were also approved. Among the small project loans approved were the first ones in the States of Oregon, Idaho, Colorado, and Hawaii.

Construction of five projects in the small projects program was completed during the year. Nine other small projects and two distribution systems were under construction. Repayment of loans under this program started during the year with the first payments by two organizations.

In total, from the start of the program to June 30, 1962, small project loans and grants of $61,850,700 and distribution system loans of $71,124,301 have been approved by the Secretary.

## *River Compacts*

The Columbia River basin compact was approved by the compact commissioners of the several basin States on October 3, 1960. The compact has been ratified by all affected States except Washington and Oregon, where bills for adoption have not yet been introduced.

The Lower Niobrara and Ponca Creek compact between Nebraska and South Dakota was ratified and is awaiting consent action by the Congress.

When called upon, the Bureau has continued to provide technical assistance with respect to negotiations on the following unperfected nterstate compacts:

Arkansas River (Arkansas and Oklahoma).
Arkansas River (Kansas and Oklahoma).
Cheyenne River (Wyoming and South Dakota).
Little Missouri River (Wyoming, Montana, and North Dakota).
Upper Niobrara River (Wyoming and Nebraska).
Red River (Arkansas, Louisiana, Oklahoma, and Texas).
Truckee-Carson-Walker Rivers and Lake Tahoe (California and Nevada).
Big Blue River (Kansas and Nebraska).

## *Hydrology*

The Hydrology Branch has continued to study the hydrologic spects of proposed water resource development projects. These tudies include, but are not limited to, evaluation of the quantity and uality of water supply in relation to the multiple-purpose requirements, determination of the amount of sediment load and its deposiion, and potential flood magnitudes and frequencies as the basis f design.

Study of flood hydrology problems associated with proposed Reclamation projects was continued during the year by preparing design torm studies and inflow design flood and frequency studies for use in pillway design. Studies were continued of emergency operating ules for use in spillway design. Flood hydrology studies were also made to establish cross drainage criteria for proposed canal structures.

A hydrometeorological study of seasonal variation in probable maximum precipitation for small basins in western Colorado is in rogress and nearing completion.

Flood control operating rules and agreements for several proposed nd existing Bureau reservoirs were reviewed and coordinated with the Corps of Engineers.

A report was prepared to present current information on the use f irrigation water on selected projects and to illustrate the quality nd extent of data obtained during usual project operation. A rogram is underway to obtain additional data needed to improve the planning, designing, and operating of irrigation projects.

Cooperative investigations of the effects of land treatment and onservation practice on yield of streams were completed with the

Agricultural Research Service and the Soil Conservation Service o the Department of Agriculture and a final report is being prepared

Cooperative studies were continued with the Geological Survey t evaluate the amount of water transpired by phreatophyte growt and the amount of water that can be salvaged by eradication of th phreatophyte infestations.

Studies were continued on determining sediment distribution i a reservoir and unit weights of reservoir sediment deposits.

Extensive studies were conducted in the field of stable channel to improve the design criteria for earth-lined and unlined canals.

The electronic computer was used to determine total sedimen loads by the Modified Einstein Procedure for several streams. Ar analysis was made of the problems associated with sediment excluding devices and settling basins, particularly with relation to determinatio of their efficiency and effectiveness.

A sediment survey was conducted of Harry Strunk Lake Nebr

Assistance in all aspects of hydrology was given to the Blue Nil River investigations project of Ethiopia, in consultation with th Denver staff.

### International Streams Investigations

The Bureau of Reclamation is represented on three internationa engineering boards of the International Joint Commission. Unde the reference of January 12, 1948, the Souris-Red Rivers Engineerin Board, through its engineering committee composed of intereste Federal agencies, initiated a joint investigation of the possibilitie of developing the Pembina River to the mutual advantage of th United States and Canada. The Board also continued the systemati collection and study of hydrologic data and related flood control an irrigation investigations in the Souris, Red, and Missouri Rive basins.

The International Pembina River Engineering Board was established by the Commission pursuant to the reference of April 3, 1962 to investigate and report upon what measures could be taken t develop the water resources of the Pembina River in the State o North Dakota and Province of Manitoba. The studies initiate under the Souris-Red Rivers reference were continued by the Pembina River Engineering Board under the Pembina River reference.

## Irrigation and Land Use

The gross value of crops, which are reported on an annual, rathe than fiscal year basis, produced on Reclamation projects in 196 vas $1,114,876,461, the third successive year in which the farm alue of crops grown exceeded $1 billion. These crops were grown n 6,885,984 irrigated acres, resulting in an average gross crop return f $161.91 per acre.

The irrigable areas of Reclamation projects increased 63,524 acres. his acreage was widely dispersed in the 17 Western States area here irrigation is necessary for full utilization of the land and ater resource potentials.

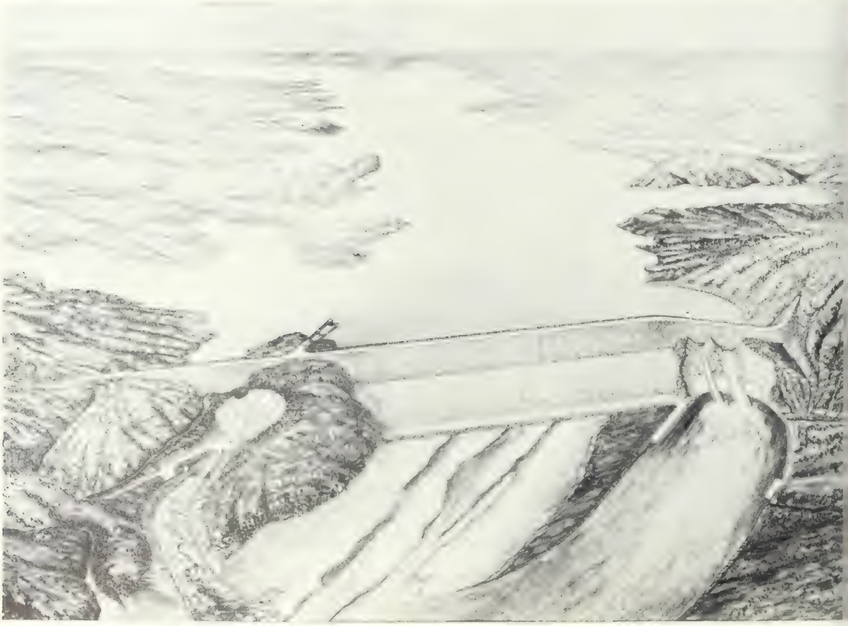
*nions are among the many diversified crops produced on lands irrigated Reclamation projects.*

There were 128,433 irrigated farms on Reclamation projects; ree-fourths of these were full-time farms and about one-fourth ere part-time units. Total farm population was 514,079 persons, n average of 4 persons per farm.

The flexibility and stability of irrigation farming is evidenced by e shifts away from surplus crops and the continuing trend in eld improvement. The acreage in grain crops decreased 102,000 res from 1960, and cotton and bean acreage declined about 30,000 nd 7,000 acres, respectively. These decreases were largely offset y increased acreage of crops not in surplus supply. The principal acreage gains over 1960 included 80,000 in sugar beets; 7,000 acre in mint; 22,000 acres in vegetables; 17,000 acres in fruit, and 20,00 acres in forage crops.

The 20 percent increase in acreage of sugar beets is the result o additional temporary domestic quotas of sugar. The recent amendment to the Sugar Act providing additional quotas to domesti producing areas should encourage further expansion in acreage of thi crop and the building of processing facilities.

Notwithstanding lower prices for some of the important crops, th net reduction from the 1960 aggregate value of production was hel to $43 million by the offsetting effects of production increases an shifts of acreage to crops in higher demand.



*Sanford Dam, now under construction on the Canadian River, will suppl municipal water to 17 cities in northwestern Texas.*

Water furnished for municipal and industrial uses from Reclamatio project facilities amounted to 483.5 billion gallons, a 21-percent increase over 1960. A total of 37 projects in 13 States participated i the delivery of this water to 83 primary contracting entities whic represent about 200 different groups of water users or large commercia enterprises. These contracting entities, in turn, serve about 9 millio water customers.

The expansion of towns and cities brought the total urbanized project land area to 191,713 acres with a population of over a million persons now residing on these once-farmed lands.

An analysis of a mature irrigation project area indicates that from 170 to 240 local off-farm employment opportunities are generated for each 100 irrigation farmers and hired farmworkers. The income of these off-farm workers would range from $200 to $270 per $100 of income accruing to the agricultural workers.

## *Repayment of Project Costs*

Consistent with the policy of securing repayment contracts as a prerequisite to the initiation of construction of a project, repayment contracts were executed in fiscal year 1962 for an appropriate share of the reimbursable costs of such projects. There were also executed numerous water service contracts, both temporary and long term, as well as several adjustments of existing contracts to adopt variable repayment plans in accordance with the water users' ability to pay and to defer or reschedule construction charges in order to alleviate the financial difficulties encountered by water users because of extended drought, agricultural price conditions, and other factors.

Agreement was reached with the State of California for construction of the $433 million joint-use facilities of the San Luis unit of the Central Valley project in California. Under this agreement the Bureau of Reclamation will construct the joint-use facilities, the State will operate them, and the cost of construction and operation and maintenance will be shared by the Bureau and the State. The State will advance 55 percent of the cost of constructing the joint works, with the remainder financed from Federal funds.

Also in the Central Valley project, a $41 million distribution ystem loan repayment contract was approved for the Arvin-Edison Water Storage District. This represents the largest distribution ystem repayment contract in the 60-year history of the Bureau of Reclamation.

Considerable progress was made in the negotiations with the three rrigation districts in the Columbia Basin project in an endeavor to each agreement on amendatory long-term contracts which would place that project on a basis similar to Federal Reclamation projects generally. In the meantime a short-form of amendatory contract has been approved for the Quincy-Columbia Irrigation District, and good progress is being made in negotiations with the other two districts. Legislation to approve contract arrangements was pending before the Congress as the fiscal year ended.

## *Contracts Executed*

A repayment contract was executed prior to initiation of constru tion of the $18 million Norman project in Oklahoma. This ne project is to supply municipal and industrial water to three Oklahom cities.

The Bureau has been involved almost continuously this fiscal ye in problems concerning repayment arrangements for the third divisio of the Riverton project in Wyoming. The President has signe Public Law 87–479, permitting the continued delivery of water to th district during calendar year 1962. Meanwhile, efforts are co tinuing to work out a permanent solution to these problems.

The President also has approved H.R. 9647 (P.L. 87–472), authorizin execution of amendatory contracts with the Burley Irrigation Distri and with the Minidoka Irrigation District, both in Idaho. Thes contracts take into account power revenues and costs with assuranc to the water users of a future power supply.

A $4,514,000 small Reclamation projects loan repayment contrac is being negotiated with the State of Hawaii for completion of th proposed Molokai project. This is the first contract to be negotiate by the Bureau of Reclamation in the new State of Hawaii.

Constant effort is made in the execution of new and the administra tion of existing repayment contracts, to take into consideration th repayment ability of the water users based on current economi conditions in order to insure that no undue burden is placed on them and at the same time that the reimbursable costs of all projects ar returned to the United States in accordance with established and ne Reclamation laws.

The value of all repayment contracts on June 30, 1962, amounted t $1,122,421,903. Of this amount, a total of $168,703,134 has bee paid and delinquencies were insignificant.

## *Recreational Use of Projects*

Recreational use of Reclamation projects totaled 25.6 millio visitor days during calendar 1961. This was an increase of 1.3 millio over the 24.3 million visitor days of such use in 1960. Recreational us of Reclamation projects during the past decade has approximatel quadrupled. The pattern of use by activities during the year wa about the same as in previous years, with totals in the order of thei importance as follows:

| *Activities* | *Number of visitor days* | *Activities* | *Number of visitor days* |
|---|---|---|---|
| Sightseeing | 10, 697, 474 | Swimming | 1, 738, 21 |
| Fishing | 4, 524, 504 | Camping | 1, 613, 85 |
| Boating and water skiing | 3, 491, 831 | Hunting | 330, 95 |
| Picnicking | 2, 758, 487 | Other | 422, 35 |

*Recreational use of Canyon Ferry Lake, on the upper Missouri River near Helena, Mont., reached 45,000 visitor days in 1961.*

Use was greater in 1961 than in 1960 in all activities except boating and water skiing and hunting. Decreases in these activities were undoubtedly associated with water shortages which occurred on many projects during 1961, resulting in smaller late-season water areas.

The use data reported do not include recreation which occurred on project farmlands and other project areas outside of those areas managed for recreational use. This unreported use, however, is ubstantial and is undertaken mainly by local and semilocal residents. On some projects, recreation use not reported may equal reported use at reservoirs and other established recreation sites. Increasing ecreational use of Reclamation facilities continues to emphasize the nadequacies of such facilities on many projects. The emphasis is urther magnified by disparities between the old—and undeveloped or recreation—projects and the new projects on which the Congress has provided authority to meet recreation needs more adequately. Recreationists continue to point out these disparities.

Steps were taken during 1961 to correct the inequitable situation with respect to recreation development on Reclamation projects. The new policy statement relative to reservoir project lands which was issued February 16, 1962, permits increased emphasis to b placed on recreation in the Reclamation program. Implementatio of this policy on old projects, however, will require enactment o authorizing legislation. With such authority, additional lands an recreation facilities can be provided to meet increasing recreationa needs.

## *Fish and Wildlife Benefits*

Reasonably adequate provisions have been made for utilizing th fish and wildlife resources of Reclamation projects. This has com about through the authority provided by the Fish and Wildlif Coordination Act of 1958 (Public Law 624, 85th Cong., 2d sess., 72 Stat. 503) and other authority. Supplementing the Federa program are the several State programs which take advantage o improved habitats created by Reclamation development to supplement existing fish and wildlife resources.

## *Weed Control*

Control of weeds in irrigation systems is essential to the economic delivery and conservation of water. The Bureau of Reclamation is continuing its comprehensive weed control program which has proved very effective in reducing the problems caused by undesirable vegetation. Operation and maintenance costs caused by weeds have been decreased and the program is aiding materially in reducing water losses resulting from transpiration, evaporation, and seepage.

More efficient and economical methods of controlling weeds infesting banks and channels of irrigation and drainage systems are being developed through the research program conducted in cooperation with the Department of Agriculture. This phase of the program is being accomplished at four field stations in the West, and in the Assistant Commissioner and Chief Engineer's Weed Control Laboratory in Denver.

From a recent survey it was estimated that nearly 2 million acre-feet of water is lost each year because of weeds on irrigation systems in the 17 Western States. It was similarly estimated that the total costs and losses caused by these weeds were about $5¾ million. The relatively small investment in research and education in weed control has prevented an additional $15.8 million in costs and losses. While research is being continued, much more effort is seriously needed to aid in solving this major irrigation problem.

Progress was made in developing more effective methods for controlling woody phreatophytes, including salt cedar, where these plants have invaded irrigation systems, natural water courses, reservoirs, and ther areas. These growths not only usurp millions of acre-feet of ater so greatly needed for irrigation, municipal, and industrial purposes, but also increase flood hazards and take over lands which hould be used for grazing and agriculture. It is estimated that in he 17 Western States all undesirable phreatophytes infest over 15 illion acres and transpire at least 25 million acre-feet of water nually. Committees of the Department of Agriculture and the epartment of the Interior are working on this and other weed con- ol problems common to Government agencies.

Special studies for developing economically feasible methods for ontrolling aquatic vegetation in large canals are being conducted cooperation with the Agricultural Research Service in the Denver aboratory and on the Columbia Basin project, Washington, and entral Valley project, California.

A halogeton control program has been developed in cooperation ith other agencies under the provisions of the Halogeton Glomeratus ct in the interest of increasing the land-use value of the lands under e jurisdiction of the Bureau and of protecting the livestock which aze on these lands. It is known that this poisonous weed infests ureau lands in Utah, Nevada, Colorado, Wyoming, and Idaho. rveys to locate halogeton infestations and cooperative investiga- ons to determine the most effective and economical control methods ere continued this year. The actual control programs, including emical spraying and grass seeding, were continued, primarily through greements with the Bureau of Land Management.

The distribution of motion pictures, slide lectures, manuals, special leases on new equipment, and articles in the Reclamation Era have een continued to advise project personnel on new and more economi- l methods for controlling weeds.

## *oil and Moisture Conservation*

The Bureau of Reclamation has continued its program of conserving il and water on lands under its jurisdiction in keeping with the epartment's policy on conservation of natural resources. These perations are directed primarily toward erosion control, reduction water losses, and the protection of Reclamation-built works.

The program includes planting grasses and trees, building structures, d carrying out other desirable erosion control and soil stabilization actices; controlling undesirable water-consuming vegetation; and acing structures to protect irrigation facilities. Special research is nducted in prevention of water losses caused by evaporation, tran- iration, and seepage. The program objectives are accomplished in operation with other Federal agencies, as well as State, local and ater users' organizations. During fiscal 1962, there were 117 individual soil and moisture conservation programs on 64 Federal irrigation projects or units.

## *Reducing Seepage Losses*

Loss of water through seepage in canals is of increasing concer to the Bureau of Reclamation. In addition to lowering the operatin efficiency of the canals, high ground water and drainage condition are compounded by these losses.

Under the Bureau's lower cost canal-lining program, studies wer continued to reduce seepage losses from canals and laterals and t prevent the waterlogging of irrigable lands. Particular emphasis wa given during the past year to the use of waterborne chemical sealants There is great need for a lining which does not necessitate taking th water out of the canals. This factor is especially true in the Southwest where canals are utilized throughout the entire year.

Experimental use of chemical sealants was accomplished on th Eden, Columbia Basin, Boise, Klamath, Gila, Belle Fourche an Missouri river basin projects.

The first large-scale installation of a buried plastic membran lining on a Bureau project was accomplished during March 1962 o the Tucumcari project in New Mexico. Over 1½ miles of th McCaskey and Savage laterals were lined with vinyl plastic.

## *Use of Water*

Increased attention is being given to efficient use of water fo irrigation. On most operating projects historical data are not adequate to reach firm conclusions regarding magnitude and extent o wastes and losses. As a result, information needed for planning design, and efficient operation of projects is often limited.

During the past year, the Bureau has undertaken a more detaile evaluation of the use of water on existing projects. The objective of this study are (1) to accurately document the present use and disposal of water on existing projects and to determine practical mean of increasing efficiency of water use, and (2) to obtain information fo improving present procedures or to develop new ones to insure successful and efficient operation of future projects.

## *Community Development*

The town of Page, Ariz., was initially established in connection wit the construction of Glen Canyon Dam, a principal feature of th Colorado River storage project. With the initial subdivision completed and utilities available to serve the municipal area, developmen has advanced rapidly. More than 50 commercial buildings have bee rected, resulting in a reasonably well-balanced complement of usinesses from which the approximate 5,000 resident population and housands of tourists who visit the adjacent dam can obtain basic ssentials and a variety of supplemental commodities and services.

Concurrently with the commercial development, construction of esidences has shown a gratifying increase because of increased vailability of financing for home construction. More than 30 private esidential structures were completed, bringing the total number of ermanent houses in the town to nearly 200.

Seven churches, an elementary school and a high school, and arious municipal and public-use buildings also have been completed.

As construction activities on Glen Canyon Dam and powerplant iminish, it is expected that there will be a compensating increase in urist and recreational activity which will adequately insure a sound asis for continued municipal growth and development in the town f Page.

Although the community is presently managed and administered by e United States, plans for the furtue are based on the assumption functional management and administration of municipal affairs as oon as practical by an appropriately organized corporate entity. s soon as such a transition is practicable, the municipality of Page, riz., will be given assistance in assuming a position of self-government comparable to that occupied by other municipalities in the tate of Arizona.

## and Settlement

During the fiscal year, the Bureau of Reclamation conducted one nd opening. In this opening, 18 full-time farm units on the Columbia asin project in the State of Washington were made available for urchase by qualified applicants.

This land opening increased to a total of 2,860 the number of farm nits, comprising 276,805 irrigable acres, which have been made available for settlement since the close of World War II, either by homeeading or by purchase, on 14 Reclamation projects.

Settlers do not pay for the public land which is opened to homeeading. Government-acquired lands are sold to settlers as farm nits. In either case, settlers pay to the Federal Government, through n irrigation district, or other recognized water users' organizations, e pro rata share of the construction costs of irrigation facilities built supply the land with water. They also pay an annual charge for peration and maintenance of the irrigation works. The construction osts are paid without interest over a long period, usually 40 or 50 ears.

## *Development Farms*

The practice of establishing development farms on new irrigation projects has removed many of the factors which caused hardships and often failures of settlers on earlier developed projects. The development farms not only demonstrate more efficient and economical irrigation practices, but also show the value of conserving soil and water through promoting more efficient use of these important natural resources. This phase of conservation is especially important in view of our increasing population and the decreasing areas suitable for agricultural development.

***Carrots harvested in the Coachella Valley on Reclamation's All-American Canal system begin trip to market.***

Development farms are established as far as possible in advance of settlement, usually 2 to 5 years, in order that much of the necessary experience and information will have been obtained when the new settlers arrive. The farms are located in areas which best represent the soils and other conditions of the new project. The sites are chosen and the plans for the development and operation of each farm are formulated in cooperation with State colleges, Department of Agriculture, and other interested agencies.

The major portion of each farm is devoted to field-scale demonstrations of approved farm irrigation systems, irrigation methods, kinds and varieties of adapted crops, cultural practices, most effective fertilizers, weed control, farm drainage, and solutions to other problems with which new irrigation farmers are faced. From 10 to 25 percent of most of the farms is set aside for research, which is conducted by State college experiment stations and cooperating agricultural agencies such as the Agricultural Research Service and the Soil Conservation Service. Methods developed from research are thoroughly tested and demonstrated on the farms. Some of the farms have served the additional purpose of aiding in determining the feasibility of projects.

The Bureau of Reclamation and other agencies responsible for the development farms work closely with the State college extension services to be certain that the information from research findings and demonstrations is properly disseminated to the new settlers. Hundreds of farmers attend the annual field days and tours at which representatives of the Bureau and the cooperating agencies explain the work in detail. The settlers are encouraged to visit the farms at any time during the year to obtain information. Pamphlets are prepared and distributed which supply data on the crops raised, yields, and other pertinent information. In addition to project farmers the development farms benefit college and high school students who visit the farms with their instructors.

There were 8 development farms in operation during fiscal 1962 and 20 farms previously operated have been discontinued because they have served their purpose. Locations for two additional development farms have been chosen for new units of the Missouri River basin project. Other farms are proposed for new areas scheduled for development.

## *Cooperation With Other Agencies*

The Bureau's activities in planning, developing, and operating Federal irrigation projects and in the conservation of natural resources on lands under its jurisdiction have been greatly facilitated through cooperation with other agencies and organizations. Their special skills, experience, and equipment have been fully utilized whenever it was to the advantage of the Government to do so.

The cooperative work is implemented by means of agreements between the Bureau and the other organizations involved which now include several agencies within the Department of Agriculture and the State colleges and extension services of the 17 contiguous Western States and the State of Alaska, as well as many other Federal, State, and local organizations.

During fiscal 1962 there were about 400 such cooperative agreements in effect. They include studies and investigations conducted on development farms, conservation activities, efficient use of soil and water, crop and cropping problems, assistance to county agricultura agents, and weed control. They cover also the development and management of reservoir, recreational, and wildlife areas, and assistance in solving many other problems pertaining to irrigation projects.

Cooperation with other agencies also includes active participation in numerous departmental, interdepartmental, basin, State, local, and other committees whose functions are related to the Bureau's interests and responsibilities.

## *Hydroelectric Power Development*

In order to utilize to the greatest advantage the irrigation water supplies made available by multipurpose reservoirs, the Bureau of Reclamation in its program of aiding in the development of America's water resources has constructed and, as of June 30, 1962, is operating 42 powerplants with an installed nameplate capacity of 5,294,550 kilowatts. In addition, the Bureau is responsible for marketing the power generated at five powerplants constructed by the Corps of Engineers with a total installed nameplate capacity of 1,070,035 kilowatts, and one powerplant installed by the International Boundary and Water Commission, with a total nameplate capacity of 31,500 kilowatts.

Sale of electric power by the Bureau during the year aggregated 26,715,730,621 kilowatt-hours, with revenues from sales totaling $73,637,750, as shown on table 4.

### *Fiscal Year Expansion*

During the fiscal year, the installed nameplate capacity of hydroelectric powerplants at Bureau of Reclamation multipurpose projects and at projects for which the Bureau is responsible for marketing the power was increased 180,000 kilowatts.

Completion of unit N–8 at the Hoover powerplant of the Boulder Canyon project provided 95,000 kilowatts of the increase in installed capacity. This unit, placed in operation December 1, 1961, brought the Hoover powerplant to its planned capacity of 1,344,800 kilowatts. The remaining 85,000 kilowatt increase resulted from the Corps of Engineers putting in service April 9, 1962, the 85,000-kilowatt unit No. 1 at its 595,000-kilowatt Oahe powerplant in South Dakota.

*Installation of Hoover powerplant's final generating unit brings the Boulder Canyon project to its full capacity of 1,344,800 kilowatts.*

The Corps of Engineers is constructing its 468,000-kilowatt Big Bend powerplant in South Dakota, and initial operation of this powerplant is scheduled for July 1964. The Bureau of Reclamation will be the marketing agent for energy generated by these new plants; as in the case for other plants constructed by the corps on the Missouri River basin project.

## *Additional Capacity Under Construction*

At the end of the fiscal year, the Bureau of Reclamation had under construction 10 powerplants which will have an ultimate installed nameplate capacity of 1,665,850 kilowatts. They are:

| Plant | Project | River | State | Nameplate capacity |
|---|---|---|---|---|
| | | | | *Kilowatts* |
| Clear Creek | Central Valley | Trinity | California | 134,000 |
| Lewiston | do | do | do | 350 |
| Spring Creek | do | do | do | 150,000 |
| Trinity | do | do | do | 100,000 |
| Upper Molina | Collbran | Cottonwod Creek | Colorado | 8,640 |
| Lower Molina | do | Plateau Creek | do | 4,860 |
| Blue Mesa | Colorado River storage | Gunnison | do | 60,000 |
| Flaming Gorge | do | Green | Utah | 108,000 |
| Glen Canyon | do | Colorado | Arizona | 900,000 |
| Yellowtail | Missouri River basin | Big Horn | Montana | 200,000 |

The hydroelectric powerplants constructed and operated or under construction by the Bureau of Reclamation, and powerplants for which the Bureau is the marketing agent are listed in table 5.

## *Transmission System*

To supply electrical energy for the Bureau's projects and to market the power which is surplus to the Bureau's needs, a transmission system including substations, switchyards, and transmission lines, has been constructed. During the fiscal year, approximately 375 circuit miles of transmission lines were completed, resulting in a total system of 11,082 circuit miles of line. As of June 30, 1962, the installed transformer capacity of the individual substations operated by the Bureau was 11,581,588 kilovolt-amperes. The transmission lines completed in fiscal year 1962 are shown in the following table:

*Transmission lines completed during fiscal year 1962*

| Project and line | Voltage (kilovolts) | In-service date | Circuit miles |
|---|---|---|---|
| Minidoka project: | | | |
| Alfresco Junction to East Burley Substation | 34.5 | January 1962 | 2.16 |
| East Burley Substation to Burley Junction | 34.5 | February 1962 | .23 |
| Missouri River basin project: | | | |
| Garrison powerplant to Mallard Substation | 115.0 | December 1961 | 55.06 |
| Mallard Substation to Rugby Substation | 115.0 | do | 58.43 |
| Jamestown Substation to Fargo Substation No. 2 | 230.0 | May 1962 | 84.30 |
| Jamestown Substation to Grand Forks Substation | 115.0 | June 1962 | 110.36 |
| Pine Bluffs, Wyo., to Sidney, Nebr | 115.0 | October 1961 | [1] 64.01 |
| Total | | | 374.55 |

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[1] Includes 6.98 miles of line placed in service between Cheyenne and Pine Bluffs, Wyo.

## *Power Marketing*

During fiscal year 1962, there were 119 contracts executed for the sale of power, transmission service, or for other types of electric service. In addition to these contracts, 44 supplemental agreements were executed to implement the supplemental power service program in the eastern division of the Missouri River basin project.

Classes and number of customers included in the 119 contracts are as follows:

| Classes of customers: | *Number of customers* |
|---|---|
| Private utilities | 20 |
| REA cooperatives | 11 |
| Municipalities | 63 |
| Federal agencies | 8 |
| State agencies | 7 |
| Irrigation districts | 4 |
| Non-REA cooperatives | 3 |
| Public utility districts | 3 |
| Total | 119 |

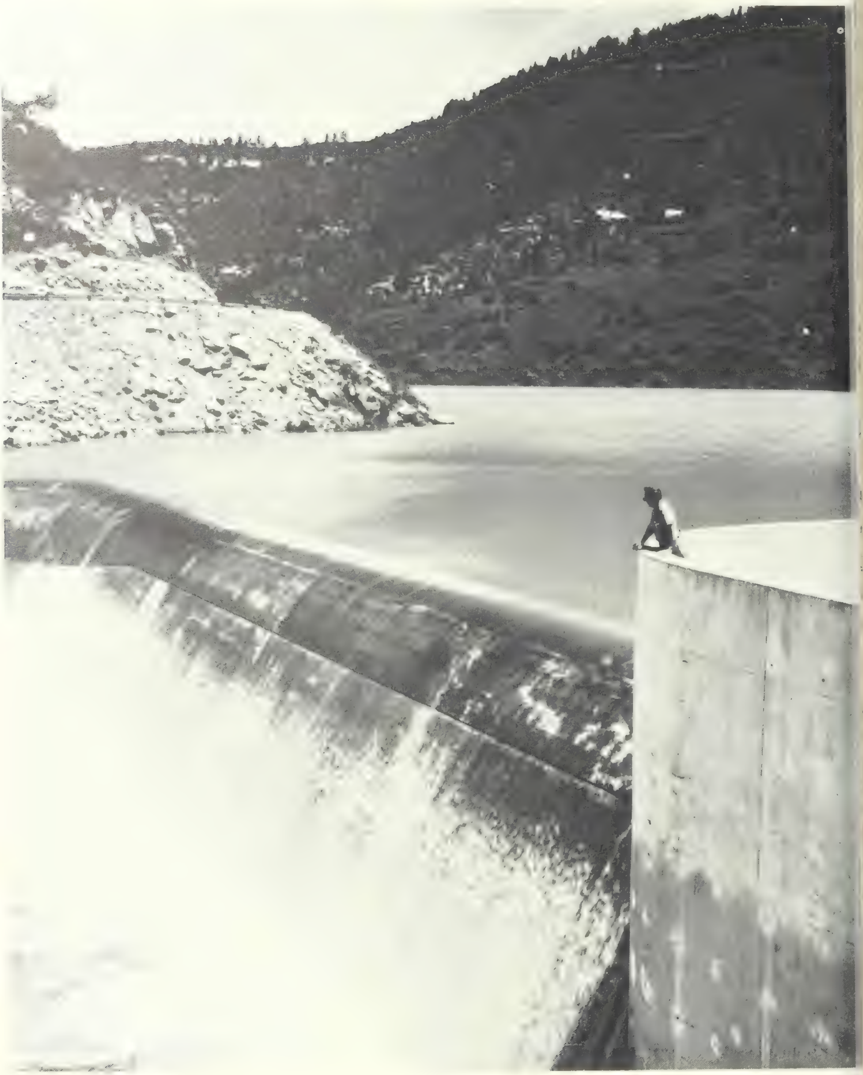
The number of contracts listed above is not representative in each nstance of new contracts, since many are renewals of current contracts n order to place the full allocation of power under contract or to ncorporate the supplemental power service program.

The Bureau is continuing its policy of contracting for wheeling power and energy beyond delivery points over other existing system acilities through mutual interchange agreements with its customers o augment the supplemental power service program.

Contracts for increased allotments of power to serve load growth hrough 1965 were executed during fiscal year 1962 to preference customers in the western division of the Missouri River basin. This action was made possible through the withdrawal of power from nonpreference customers on termination of their contracts and from the addition of new capacity within the area.

Contracts were executed with four private utility systems in the Upper Colorado River Basin for providing transmission and exchange power service for the Colorado River storage project developments at the Glen Canyon, Flaming Gorge, Curecanti, and Central Utah project units.

Preference customers within the Upper Colorado River storage project have been invited to submit applications for allotments of CRSP power which is to become available during 1963. The irst unit at the Glen Canyon Dam is scheduled for commercial



*Paonia Dam, Colo.—the first participating project of Reclamation's Colorado River storage project to be completed and placed in operation.*

operation about June 1964. The total capacity of the project power system is about 1,200,000 kilowatts.

Contracts were executed with the Colorado-Ute Electric Association and the Salt River Project Agricultural Improvement & Power District, Arizona. These provide for interconnecting both the Hayden 150,000-kilowatt thermal plant, to be constructed near Craig, Colo., and a planned second plant near Shiprock, N. Mex., with the Colorado River storage project thereby permitting exchange of electric power and energy at various points within the CRSP system on a displacement basis.

Reallocation of power contracts from the Parker-Davis project in three-State southwest area was completed during the year. Of the 194,525 kilowatts available for preference customer consumption, 174,525 kilowatts were committed on a firm basis and the remaining 20,000 kilowatts were allocated subject to recapture by the United States on 2 years' prior notice.

Power from the Trinity River division of the Central Valley project s scheduled to become available starting about February 1, 1963. Preference customers within the Bureau's Region 2 marketing area were invited to submit applications not later than March 1, 1962, respecting their power requirements. The ultimate dependable capacity of the project will be set by a mutual redetermination of project dependable capacity under the terms of the existing contract between the Pacific Gas & Electric Company and the United States.

## *Financing Reclamation Projects*

Appropriations made available to the Bureau of Reclamation for all purposes in fiscal year 1962 totaled $274,408,100. Permanent appropriations are not included. Appropriations for 1962 were less than those of 1961 by $7.3 million.

With an unobligated balance of $33.4 million carried over from fiscal year 1961 for construction, investigations, and the loan program plus unds advanced by water users, trust funds, the continuing fund for emergency expenses of Fort Peck project and new appropriations, the total amount available to Reclamation was $308 million. Of this amount there remained unobligated at the close of 1962 for use in iscal year 1963 funds in the amount of $15.9 million.

Funds appropriated, by activity, for fiscal year 1962, together with the amounts to be derived from the special and general funds are shown n the following condensed statement:

*Condensed statement of appropriations, fiscal year 1962 (exclusive of trust funds and permanent appropriations)*

| | | |
|---|---|---|
| General investigations | | $6, 643, 000 |
| Reclamation fund | $5, 520, 000 | |
| Colorado River development fund | 500, 000 | |
| General fund | 623, 000 | |
| Construction and rehabilitation | | 152, 405, 500 |
| Reclamation fund | 67, 400, 000 | |
| General fund | 85, 005, 500 | |
| Operation and maintenance | | 36, 189, 000 |
| Reclamation fund | 30, 687, 000 | |
| Colorado River Dam fund | 1, 491, 000 | |
| General fund | 4, 011, 000 | |
| General administrative expenses | | 9, 430, 000 |
| Reclamation fund | 9, 430, 000 | |
| Upper Colorado River Basin fund | | 52, 534, 500 |
| General fund | 52, 534, 500 | |
| Construction of recreational and fish and wildlife facilities | | 2, 933, 500 |
| General fund | 2, 933, 500 | |
| Loan program | | 13, 272, 600 |
| General fund | 13, 272, 600 | |
| Emergency fund | | 1, 000, 000 |
| Reclamation fund | 1, 000, 000 | |
| Grand total | 274, 408, 100 | 274, 408, 100 |
| Reclamation fund | | 114, 037, 000 |
| Colorado River development fund | | 500, 000 |
| Colorado River Dam fund | | 1, 491, 000 |
| General fund | | 158, 380, 100 |
| | | 274, 408, 100 |

# *Foreign Activities*

Bureau of Reclamation "know-how" in the field of water resources development continued in demand throughout the world during fiscal year 1962.

Revised programing schedules in the Agency for International Development call for completion of the reconnaissance study of the Blue Nile River basin in Ethiopia by the end of fiscal year 1964. Based on this revised schedule, field activities in geology and land classification were completed this year.

The Helmand Valley project in Afghanistan, providing technical assistance and on-the-job training in operation and maintenance of an existing irrigation project, continued to expand. Twenty Bureau technicians were on the rolls or under recruitment at the end of the fiscal year. In cooperation with the Bureau personnel working in Afghanistan, long-term training programs in the United States, combining academic and in-service training, were arranged for four employees of the Helmand Valley Authority. Similar programs are being arranged for other selected employees of the Authority. The training is designed to prepare the participants for responsible positions with the Authority.

Under the provisions of Public Law 402, the Bureau of Reclamation continued to provide assistance and training to the Snowy Mountains Hydroelectric Authority of Australia, the Royal Irrigation Department of Thailand, and the Central Water and Power Authority of India. Recognizing the increased professional proficiency of its staff, and the ability to provide in-service training for their junior engineers, officials of the Australian Snowy Mountains Hydroelectric Authority notified the Bureau that, with the exception of an occasional specialist, they would no longer send employees to the Bureau for training. This successfully concluded the training program under which the Authority has sent 11 liaison officers, 18 official observers, and 110 trainees to the Bureau during the last 10 years. Technical assistance on design and construction is expected to continue.

During the year, the Bureau arranged training and observation programs ranging from a few days to a year or more in duration for 165 foreign engineers and technicians from 47 countries. Included in this number were the following special groups:

(1) *11-man team of hydroelectric power specialists from the Union of Soviet Socialist Republics.*—Under the terms of the U.S.-U.S.S.R. agreements for exchanges in scientific, technical, and other fields, the Bureau arranged a 4-week program and provided technical escorts for this team. The program included visits to approximately 20 of the major hydroelectric facilities in the country.

(2) *Irrigation and reclamation observation team.*—The Bureau arranged a program in the operation and maintenance of irrigation systems for six officials of irrigation organizations from the Republic of China. A representative of the Bureau acted as technical escort for the team during its 6-week program.

In addition to the project-type assistance and on-the-job training for foreign engineers and technicians at Bureau of Reclamation facilities in the United States, Reclamation personnel were in demand for short-term details to various parts of the world. Details to assist foreign governments involved 17 individuals assigned to 9 countries. Technical problems in design, construction, operation and maintenance, farm settlement, agricultural economics, drainage, and project planning also were frequently referred to the Bureau's Engineering Center in Denver.

Although the major portion of the requests for assistance were received through the Agency for International Development, services were also provided to the United Nations, the International Bank for Reconstruction and Development, the Pan American Union, the Inter-American Development Bank, and, in some instances, directly to the foreign governments.

A number of Reclamation engineers participated in the activities of various international technical societies. The Bureau was represented at the following meetings and conferences:

Annual Meeting of Executive Committee, International Commission on Irrigation and Drainage—Moscow, U.S.S.R.
Latin American Electric Power Seminar, Mexico City.
Ninth Congress, International Association of Hydraulic Research, Dubrovnik, Yugoslavia.
Nineteenth General Assembly, International Conference on Large Electric Systems, Paris, France.
Annual Meeting of Executive Committee, International Congress on Large Dams, Moscow, U.S.S.R.
FAO European Water Management Seminar and Study Tour.
Annual Meeting of Executive Committee, International Commission on Irrigation and Drainage, Jerusalem, Israel.
ECAFE Interregional seminar on Field Methods and Equipment Used in Hydrology and Hydrometeorology, Bangkok, Thailand

# *Statistical Summary*

Table 1. Major Bureau of Reclamation contracts Awarded in fiscal year 1962
Table 2. Principal features completed on Bureau of Reclamation projects in fiscal year 1962
Table 3. Bureau of Reclamation construction indexes, fiscal year 1962
Table 4. Power sales and revenues by projects
Table 5. Hydroelectric powerplants
Table 6. Classification of power customers
Table 7. Acreage, production, and gross crop value by crops and types of crops
Table 8. Irrigation and gross crop value data, by projects, for each State
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Table 10. The reclamation fund, funds available for appropriation, fiscal years 1961–62

TABLE 1.—*Major Bureau of Reclamation contracts awarded in fiscal year 196*

| Feature | Project | Amount o award |
|---|---|---|
| Sanford Dam | Canadian River | $17,868,16 |
| Blue Mesa Dam and powerplant | Colorado River Storage | 13,706,23 |
| Glen Canyon-Flagstaff-Pinnacle Peak 240-mile, 345-kilovolt transmission line. | do | 12,847,83 |
| 222 miles of Gas Point Road-Elverta, Elverta-Hedge, and Hedge-Tracy 230-kilovolt transmission lines. | Central Valley | 10,611,01 |
| Completion of Glen Canyon powerplant, switchyard, dam, and appurtenant works. | Colorado River Storage | 7,891,27 |
| Curecanti-Craig 180-mile, 230-kilovolt transmission line | do | 6,923,10 |
| Cheney Dam | Wichita | 6,661,96 |
| Glen Canyon-Shiprock 182-mile, 230-kilovolt transmission line | Colorado River Storage | 4,854,54 |
| Willard Dam, third stage | Weber Basin | 4,712,47 |
| Cortez-Curecanti 101-mile, 230-kilovolt transmission line | Colorado River Storage | 4,224,51 |
| Causey Dam | Weber Basin | 3,836,41 |
| Norman Dam and 2 miles of State Highway No. 9 relocation | Norman | 3,692,17 |
| Red Bluff diversion dam | Central Valley | 3,465,15 |
| Clark Canyon Dam | Missouri River Basin | 3,347,40 |
| Constructing foundations and furnishing and erecting steel towers for 160-mile Dawson County-Custer Section of Yellowtail-Dawson County 230-kilovolt transmission line. | do | 3,141,95 |
| Willard Canal, pumping plants and intake channel | Weber Basin | 3,138,41 |
| Completion of Trinity, Clear Creek, and Spring Creek powerplants and Clear Creek switchyard. | Central Valley | 2,949,10 |
| Barretts diversion dam and 23 miles of East Bench Canal and laterals. | Missouri River Basin | 2,420,61 |
| 14.1 miles of Ainsworth Canal | do | 2,384,99 |
| 13.8 miles of relocation of Chicago, Rock Island, and Pacific Railroad and one-half mile of connections to Chicago, Burlington and Quincy Railroad—Norton Dam. | do | 2,381,60 |
| Completion of Flaming Gorge powerplant and switchyard | Colorado River Storage | 1,971,82 |
| 20 miles of concrete pipelines and 8 miles of laterals, Madera Distribution System. | Central Valley | 1,874,91 |
| 19 miles of pipelines and 6 reservoirs, El Dorado Distribution System. | do | 1,765,94 |
| Bully Creek Dam and Feeder Canal | Vale | 1,689,90 |
| 13 miles of East Bench Canal and 30 miles of East Bench laterals and wasteways. | Missouri River Basin | 1,644,85 |
| 90 miles of Farwell main laterals and Farwell lower main laterals. | do | 1,557,14 |
| Eagle Butte, Martin, Maurine, Mission, and Newell substations. | do | 1,356,99 |
| 26 miles of Trinity-Clear Creek, Clear Creek-Keswick, and Spring Creek-Keswick 230-kilovolt transmission lines. | Central Valley | 1,312,37 |
| 13 miles of El Dorado main and laterals | do | 1,181,03 |
| Keswick-Gas Point Road-Cottonwood 22-mile, 230-kilovolt transmission line. | do | 1,158,41 |
| 7.7 miles of Ainsworth Canal | Missouri River Basin | 1,152,98 |
| 37 miles of laterals and wasteways, block 23, Wahluke Branch Canal laterals. | Columbia Basin | 1,055,22 |
| Florida Farmers Ditch diversion dam, 3.7 miles of ditch enlargement, and 1.7 miles of Florida Canal enlargement. | Florida | 1,042,60 |
| 2,240,000 feet of conductor for Glen Canyon-Shiprock 230-kilovolt transmission line. | Colorado River Storage | 1,010,24 |

TABLE 2.—*Principal features completed on Bureau of Reclamation projects in fiscal year 1962*

| Feature | Project | State |
|---|---|---|
| Hope Valley and Frenchman Hills pumping plants and discharge lines. | Columbia Basin | Washington. |
| 9 miles of laterals and wasteways | do | Do. |
| Enlargement of 2.1 miles of Potholes Canal | do | Do. |
| Ochoco Relift and Barnes Butte pumping plants and discharge lines. | Crooked River | Oregon. |
| 7 miles of talent lateral rehabilitation | Rogue River | Do. |
| 2 miles of west lateral rehabilitation and 10 miles of west lateral. | do | Do. |
| 7 miles of pipelines for El Dorado distribution system | Central Valley | California |
| 0 miles of pipelines and 10 pumping plants, Stone Corral Irrigation District. | do | Do. |
| 0 miles of laterals, 1.5 miles of pipelines for Madera distribution system, part 1 extension. | do | Do |
| miles of laterals, 20 miles of pipelines for Madera distribution system, part 2 extension. | do | Do. |
| 1-mile Clear Creek Tunnel | do | Do. |
| Trinity powerplant structure | do | Do. |
| miles of Trinity County Road and bridge over Trinity River. | do | Do. |
| Clearing of 5,595 acres of Trinity Reservoir | do | Do. |
| miles of laterals, 13 miles of drains for sump 3 | Klamath | Do. |
| miles of laterals, 7 miles of drains, leveling 2 miles of existing dikes for sump 2. | do | Do. |
| Generator unit N–8 for Hoover powerplant | Boulder Canyon | Nevada. |
| nstallation of equipment, including turbine for unit N–8, Hoover powerplant. | do | Do. |
| Upper and lower Molina powerplant structures | Collbran | Colorado. |
| Clearing of 15,600 acres of Navajo Reservoir | Colorado River Storage | New Mexico. |
| Hammond Diversion Dam | Hammond | Do. |
| Hammond pumping plant, penstock, and discharge line. | do | Do. |
| Paonia Dam | Paonia | Colorado. |
| ronstone diversion dam and 530 feet of Ironstone Canal | Uncompahgre | Do. |
| miles of pipeline laterals for Davis aqueduct system | Weber Basin | Utah. |
| miles of Willard Canal, 13 miles of surface drains and irrigation ditches. | do | Do. |
| miles of pipeline laterals for West Farmington lateral system. | do | Do. |
| Clearing 8 miles of floodway channel, Albuquerque area unit 1. | Middle Rio Grande | New Mexico. |
| 3 miles of pressure pipe, 13 miles of pipe for aqueduct and laterals, Foss aqueduct and Clinton, Bessie, and Cordell laterals. | Washita Basin | Oklahoma. |
| treets, sidewalks, water and sewer systems for Yellowtail Dam Government camp. | Missouri River Basin | Montana. |
| ineteen 3-bedroom residences for Yellowtail Government camp. | do | Do. |
| elocation of 15 miles of railroad at Clark Canyon Reservoir. | do | Do. |
| oundations and steel towers for 84-mile Jamestown-Fargo 230-kilovolt transmission line No. 2. | do | North Dakota. |
| 4-mile Garrison-Minot-Rugby 115-kilovolt transmission line. | do | Do. |
| 0-mile Jamestown-Grand Forks 115-kilovolt transmission line. | do | Do. |
| oundations and steel towers for 136-mile Garrison-Jamestown 230-kilovolt transmission line. | do | Do. |
| tringing conductor and overhead ground wire for 84-mile Jamestown-Fargo 230-kilovolt-transmission line. | do | Do. |
| oundations and steel towers for 57-mile Oahe-Fort Thompson 230-kilovolt transmission line. | do | South Dakota. |
| tringing conductors for second circuit additions for 74-mile Watertown-Granite Falls 230-kilovolt transmission line. | do | Do. |
| miles of Culbertson extension canal and 19 miles of laterals. | do | Nebraska. |
| ed Willow Dam | do | Do. |
| herman Dam | do | Do. |
| miles of Cedar Bluff Canal, 1 mile of drains | do | Kansas. |
| -mile Cheyenne-Pine Bluffs-Sidney 115-kilovolt transmission line. | do | Wyoming-Nebraska. |

TABLE 3.—*Bureau of Reclamation construction indexes, fiscal year 1962*

[For application to field costs only]

| Cost indexes based on January 1940 costs=$1.00 | July 1961 | January 1962 | June 1962 |
|---|---|---|---|
| Dams: | | | |
| Earth | 2.18 | 2.20 | 2.20 |
| Dam structure | 1.86 | 1.90 | 1.90 |
| Spillway | 2.43 | 2.47 | 2.47 |
| Outlet works | 2.73 | 2.77 | 2.77 |
| Concrete | 2.36 | 2.38 | 2.38 |
| Diversion | 2.67 | 2.69 | 2.71 |
| Pumping Plants: | | | |
| Building and equipment | 2.93 | 2.99 | 3.01 |
| Structures and improvements [1] | 2.98 | 3.00 | 3.05 |
| Equipment | 2.99 | 3.02 | 3.04 |
| Pumps and prime movers | 3.06 | 3.06 | 3.08 |
| Accessory electric and miscellaneous equipment | 2.88 | 2.94 | 2.96 |
| Steel penstocks and discharge pipes | 3.88 | 3.97 | 3.99 |
| Canals and conduits: | | | |
| Canals | 2.38 | 2.38 | 2.40 |
| Canal earthwork | 1.44 | 1.44 | 1.44 |
| Canal structures | 3.23 | 3.29 | 3.34 |
| Conduits (tunnels, free-flow, concrete-lined) | 2.87 | 2.94 | 2.94 |
| Laterals and drains | 3.17 | 3.24 | 3.27 |
| Lateral earthwork | 1.46 | 1.47 | 1.47 |
| Lateral structures | 3.96 | 4.09 | 4.14 |
| Powerplants, hydro: | | | |
| Building and Equipment | 2.95 | 3.01 | 3.03 |
| Structures and improvements [1] | 2.96 | 3.01 | 3.06 |
| Equipment | 2.93 | 2.98 | 3.00 |
| Turbines and generators | 2.93 | 2.97 | 2.99 |
| Accessory electric equipment | 2.72 | 2.76 | 2.78 |
| Miscellaneous equipment | 2.92 | 2.96 | 2.96 |
| Concrete pipelines | 2.49 | 2.51 | 2.51 |
| Switchyards and substations | 2.92 | 2.96 | 2.96 |
| Transmission lines: | | | |
| Wood-pole 115-kv | 2.57 | 2.59 | 2.59 |
| Poles and fixtures | 2.46 | 2.53 | 2.53 |
| Overhead conductors and devices | 2.65 | 2.61 | 2.61 |
| Steel-tower, 230-kv | 2.83 | 2.85 | 2.85 |
| General property (buildings) | 3.16 | 3.21 | 3.21 |
| Roads and bridges: | | | |
| Primary roads | 2.58 | 2.58 | 2.58 |
| Secondary roads (unsurfaced) | 2.37 | 2.38 | 2.38 |
| Bridges (steel) | 3.25 | 3.31 | 3.31 |
| Composite index (indicates general cost trend) | 2.67 | 2.71 | 2.71 |

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[1] Indexes for structures and improvements on pumping plants and powerplants are based on a reinforced concrete structure.

ABLE 4.—*Bureau of Reclamation power systems, power sales, and revenues by projects, fiscal year ending June 30, 1962*

| Projects | Sales of electric energy, kilowatt hours [1] | Revenues from sales [1] |
|---|---|---|
| oulder Canyon | 3, 162, 525, 663 | $8, 465, 877. 99 |
| entral Valley | 2, 915, 441, 830 | 11, 522, 675. 00 |
| olumbia Basin [2] | 12, 103, 666, 360 | 13, 193, 115. 00 |
| klutna | 169, 436, 098 | 1, 733, 557. 70 |
| alcon | 110, 351, 400 | 395, 068. 42 |
| ort Peck | 39, 437, 939 | 165, 505. 52 |
| ungry Horse [2] | 798, 615, 700 | 3, 840, 628. 00 |
| inidoka Units 1 through 6 | 202, 776, 850 | 1, 062, 705. 14 |
| issouri River Basin: | | |
| Eastern Division | 3, 828, 393, 761 | 16, 071, 991. 63 |
| Western Division [3] | 1, 592, 866, 180 | 10, 005, 315. 60 |
| alisades, Boise, and Minidoka Unit 7 | 443, 625, 993 | 1, 543, 424. 65 |
| arker-Davis | 1, 105, 557, 461 | 4, 444, 982. 00 |
| rovo River | 11, 237, 454 | 34, 481. 81 |
| io Grande | 61, 428, 658 | 348, 365. 96 |
| ogue River Basin | 44, 102, 000 | 317, 480. 40 |
| eber Basin | 9, 020, 900 | 29, 303. 00 |
| akima [2] | 106, 219, 448 | 430, 960. 00 |
| uma | 11, 026, 926 | 32, 312. 06 |
| Grand Total | 26, 715, 730, 621 | 73, 637, 749. 88 |

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[1] Does not include energy sales and revenues in transactions between Bureau projects

[2] Deliveries to and revenues from Bonneville Power Administration included as follows:

| | | |
|---|---|---|
| Columbia Basin | 11, 317, 435, 236 | $12, 800, 000. 00 |
| Hungry Horse | 795, 659, 000 | 3, 833, 000. 00 |
| Yakima | 75, 019, 182 | 345, 000. 00 |
| Total | 12, 188, 113, 418 | 16, 978, 000. 00 |

[3] Includes systems of Riverton, Shoshone, Colorado-Big Thompson, Kendricks and North Platte projects.

## TABLE 5.—*Hydroelectric powerplants*

### A. CONSTRUCTED AND OPERATED BY BUREAU OF RECLAMATION

June 30, 1962

| State | Project | Name of plant | Calendar year of initial operation | Nameplate rating | |
|---|---|---|---|---|---|
| | | | | Existing (kilowatts) | Ultimat (kilowatt |
| 1. Alaska | Eklutna | Eklutna | 1955 | 30,000 | 30,0 |
| 2. Arizona, Nevada | Boulder Canyon | Hoover [1] | 1936 | 1,344,800 | 1,344,8 |
| 3. Arizona-Nevada | Parker-Davis | Davis | 1951 | 225,000 | 225,0 |
| 4. Arizona-California | do | Parker | 1942 | 120,000 | 120,0 |
| 5. California | Central Valley | Folsom | 1955 | 162,000 | 162,0 |
| 6. California | do | Keswick | 1949 | 75,000 | 75,0 |
| 7. California | do | Nimbus | 1955 | 13,500 | 13,5 |
| 8. California | do | Shasta | 1944 | 379,000 | 379,0 |
| 9. California | Yuma | Siphon Drop | 1926 | 1,600 | 1,6 |
| 10. Colorado | Colorado-Big Thompson | Big Thompson | 1959 | 4,500 | 4,5 |
| 11. Colorado | do | Estes | 1950 | 45,000 | 45,0 |
| 12. Colorado | do | Flatiron | 1954 | 71,500 | 71,5 |
| 13. Colorado | do | Green Mountain | 1943 | 21,600 | 21,6 |
| 14. Colorado | do | Marys Lake | 1951 | 8,100 | 8,1 |
| 15. Colorado | do | Pole Hill | 1954 | 33,250 | 33,2 |
| 16. Colorado | Grand Valley | Grand Valley [2] | 1932 | 3,000 | 3,0 |
| 17. Idaho | Boise | Anderson Ranch | 1950 | 27,000 | 40,5 |
| 18. Idaho | do | Black Canyon | 1925 | 8,000 | 8,0 |
| 19. Idaho | do | Boise Diversion | 1912 | 1,500 | 1,5 |
| 20. Idaho | Minidoka | Minidoka | 1909 | 13,400 | 13,4 |
| 21. Idaho | Palisades | Palisades | 1957 | 114,000 | 114,0 |
| 22. Montana | Missouri River Basin | Canyon Ferry | 1953 | 50,000 | 50,0 |
| 23. Montana | Hungry Horse | Hungry Horse | 1952 | 285,000 | 285,0 |
| 24. New Mexico | Rio Grande | Elephant Butte | 1940 | 24,300 | 24,3 |
| 25. Oregon | Rogue River Basin | Green Springs | 1960 | 16,000 | 16,0 |
| 26. South Dakota | Missouri River Basin | Angostura | 1951 | 1,200 | 1,2 |
| 27. Utah | Provo River | Deer Creek | 1958 | 4,950 | 4,9 |
| 28. Utah | Weber Basin | Gateway | 1958 | 4,275 | 4,2 |
| 29. Utah | do | Wanship | 1958 | 1,425 | 1,4 |
| 30. Washington | Columbia Basin | Grand Coulee | 1941 | 1,974,000 | 1,974,0 |
| 31. Washington | Yakima | Chandler | 1956 | 12,000 | 12,0 |
| 32. Washington | do | Roza | 1958 | 11,250 | 11,2 |
| 33. Wyoming | Missouri River Basin | Fremont Canyon | 1960 | 48,000 | 48,0 |
| 34. Wyoming | Kendrick | Alcova | 1955 | 36,000 | 36,0 |
| 35. Wyoming | do | Seminoe | 1939 | 32,400 | 32,4 |
| 36. Wyoming | Missouri River Basin | Boysen | 1952 | 15,000 | 15,0 |
| 37. Wyoming | do | Glendo | 1958 | 24,000 | 24,0 |
| 38. Wyoming | do | Kortes | 1950 | 36,000 | 36,0 |
| 39. Wyoming | North Platte | Guernsey | 1927 | 4,800 | 4,8 |
| 40. Wyoming | Riverton | Pilot Butte | 1925 | 1,600 | 1,6 |
| 41. Wyoming | Shoshone | Heart Mountain | 1948 | 5,000 | 5,0 |
| 42. Wyoming | do | Shoshone | 1922 | 5,600 | 5,6 |
| Subtotal A | | | | 5,294,550 | 5,308,0 |

### B. CONSTRUCTED AND OPERATED BY OTHERS—POWER MARKETED BY USBR

| State | Project | Name of plant | Calendar year of initial operation | Existing (kilowatts) | Ultimat (kilowatt |
|---|---|---|---|---|---|
| 1. Montana | Missouri River Basin (USCE). | Fort Peck | 1943 | 165,000 | 165,0 |
| 2. North Dakota | do | Garrison | 1956 | 400,000 | 400,0 |
| 3. Nebraska-South Dakota. | do | Fort Randall | 1954 | 320,000 | 320,0 |
| 4. South Dakota | do | Gavins Point | 1956 | 100,035 | 100,0 |
| 5. South Dakota | do | Oahe | 1962 | 85,000 | 595,0 |
| 6. Texas | Falcon (IBWC) | Falcon | 1954 | 31,500 | 42,0 |
| Subtotal B | | | | 1,101,535 | 1,622,0 |

## TABLE 5.—*Hydroelectric powerplants*—Continued

### C. UNDER CONSTRUCTION BY BUREAU OF RECLAMATION

June 30, 1962

| State | Project | Name of plant | Calendar year of initial operation | Nameplate rating | |
|---|---|---|---|---|---|
| | | | | Existing (kilowatts) | Ultimate (kilowatts) |
| Arizona | Colorado River Storage | Glen Canyon | 1964 | 0 | 900,000 |
| California | Central Valley | Clear Creek | 1963 | 0 | 134,000 |
| California | do | Lewiston | 1962 | 0 | 350 |
| California | do | Spring Creek | 1963 | 0 | 150,000 |
| California | do | Trinity | 1963 | 0 | 100,000 |
| Colorado | Collbran | Upper Molina | 1962 | 0 | 8,640 |
| Colorado | do | Lower Molina | 1962 | 0 | 4,860 |
| Colorado | Colorado River Storage | Blue Mesa | 1966 | 0 | 60,000 |
| Montana | Missouri River Basin | Yellowtail | 1966 | 0 | 200,000 |
| Utah | Colorado River Storage | Flaming Gorge | 1963 | 0 | 108,000 |
| Subtotal C | | | | | 1,665,850 |

### D. UNDER CONSTRUCTION BY OTHERS—POWER TO BE MARKETED BY USBR

| | | | | | |
|---|---|---|---|---|---|
| South Dakota | Missouri River Basin (USCE). | Big Bend | 1964 | 0 | 468,000 |

Powerplant units operated by Southern California Edison Co. and city of Los Angeles Department of ater and Power as agents of the United States.

Leased to Public Service Co. of Colorado for operation.

USCE—United States Corps of Engineers.
IBWC—International Boundary and Water Commission.

## ABLE 6.—*Summary by classification of customers for 12 months ending June 30, 1962* [1]

| | Number of customers | Sale of electric energy kilowatt-hours | Revenues from sales |
|---|---|---|---|
| ivately Owned Utilities | 30 | 1,563,659,471 | 5,873,237.80 |
| unicipal Utilities | 134 | 2,110,707,925 | 10,066,304.40 |
| ate Government Utilities | 14 | 4,186,537,242 | 15,434,336.24 |
| operative Utilities (Rural Electrification Admin. Projects) | 53 | 3,235,308,981 | 16,420,504.03 |
| her Federal Utilities [2] | 8 | 12,245,896,213 | 17,230,636.45 |
| sidential and Domestic | 296 | 6,535,808 | 32,799.02 |
| ral (other than Rural Electrification Admin. Projects) | 7 | 165,600 | 1,058.11 |
| mmercial and Industrial | 13 | 93,114,882 | 496,291.23 |
| blic Authorities | 90 | 2,089,143,893 | 6,696,625.32 |
| terdepartmental | 38 | 1,184,660,606 | 1,385,957.28 |
| Total all customers | 683 | 26,715,730,621 | 73,637,749.88 |

Does not include energy sales and revenues in transactions between Bureau projects

Totals include 12,188,113,418 kilowatt-hours delivered to Bonneville Power Administration for marketing d $16,978,000.00 in payment by that agency.

TABLE 7.—*Acreage, production, and gross crop value by crops and types of crops–*
*1961*

| Crops | Irrigated lands | | Tonnage | | Gross crop value | |
|---|---|---|---|---|---|---|
| | Total | Percent of total | Total | Percent of total | Total | Percei of total |
| Cereals: | *Acres* | *Percent* | *Tons* | *Percent* | *Dollars* | *Perce* |
| Barley | 521, 702 | 7. 58 | 724, 201 | 2. 099 | 30, 576, 513 | 2. |
| Corn | 307, 816 | 4. 47 | 644, 409 | 1. 867 | 27, 594, 593 | 2. |
| Oats | 165, 006 | 2. 40 | 151, 344 | . 439 | 6, 585, 960 | . |
| Rice | 7, 021 | . 10 | 14, 049 | . 041 | 1, 222, 387 | . |
| Rye | 2, 928 | . 04 | 2, 791 | . 008 | 117, 330 | . |
| Sorghums (sorgo, kaffir, etc.) | 116, 362 | 1. 69 | 189, 301 | . 549 | 8, 657, 847 | . |
| Wheat | 388, 070 | 5. 63 | 554, 569 | 1. 607 | 32, 480, 969 | 2. |
| Other cereals | 88, 227 | 1. 28 | 132, 563 | . 384 | 5, 812, 146 | . |
| Total Cereals | 1, 597, 132 | 23. 19 | 2, 413, 227 | 6. 994 | 113, 047, 745 | 10. |
| Forage: | | | | | | |
| Alfalfa hay | 1, 809, 602 | 27. 28 | 6, 990, 827 | 20. 260 | 146, 317, 409 | 13. |
| Other hay | 170, 950 | 2. 48 | 319, 241 | . 925 | 6, 175, 396 | . |
| Irrigated pasture | 985, 010 | 14. 31 | 2, 059, 267 | 5. 968 | 33, 399, 554 | 3. |
| Corn fodder | 10, 714 | . 16 | 90, 556 | . 262 | 720, 100 | . |
| Silage or Ensilage | 177, 656 | 2. 58 | 2, 976, 347 | 8. 626 | 19, 934, 912 | 1. |
| Crop residue: Beet tops | | | 2, 456, 484 | 7. 119 | 1, 840, 315 | . |
| Stubble, stalks, etc | | | 144, 559 | . 419 | 1, 226, 949 | . |
| Straw (all kinds) | | | 173, 768 | . 504 | 1, 196, 600 | . |
| Root crops (carrots, etc.) | 41 | | 5, 445 | . 016 | 24, 675 | |
| Other forage | 45, 600 | . 66 | 44, 593 | . 129 | 674, 636 | . |
| Total Forage | 3, 199, 573 | 46. 47 | 15, 261, 087 | 44. 228 | 211, 510, 546 | 18. |
| Miscellaneous Field crops: | | | | | | |
| Beans, castor | 1, 319 | . 02 | 1, 094 | . 003 | 126, 311 | . |
| Beans, dry and edible | 356, 214 | 5. 17 | 348, 514 | 1. 010 | 43, 300, 317 | 3. |
| Broomcorn | 2, 754 | . 04 | 21, 373 | . 062 | 166, 760 | . |
| Cotton, lint (Upland) | 464, 723 | 6. 75 | 227, 327 | . 659 | 155, 623, 467 | 13. |
| Cotton, seed (Upland) | | | 368, 717 | 1. 069 | 20, 102, 485 | 1. |
| Cotton, lint (American-Egyptian) | 32, 601 | . 47 | 8, 469 | . 025 | 9, 678, 325 | . |
| Cotton, seed (American-Egyptian) | | | 14, 602 | . 042 | 843, 539 | . |
| Hops | 15, 965 | . 23 | 12, 937 | . 037 | 11, 243, 900 | 1. |
| Peppermint | 18, 998 | . 28 | 847 | . 002 | 5, 246, 989 | . |
| Spearmint | 11, 400 | . 17 | 577 | . 002 | 3, 221, 163 | . |
| Sugar Beets | 474, 441 | 6. 89 | 8, 394, 790 | 24. 329 | 86, 847, 624 | 7. |
| Other miscellaneous field crops | 5, 424 | . 08 | 5, 494 | . 016 | 580, 560 | . |
| Total Miscellaneous Field Crops | 1, 383, 839 | 20. 10 | 9, 404, 741 | 27. 256 | 336, 981, 440 | 30. |
| Vegetables: | | | | | | |
| Asparagus | 16, 067 | . 23 | 24, 465 | . 071 | 5, 411, 828 | . |
| Beans (processing) | 13, 428 | . 20 | 22, 640 | . 066 | 3, 091, 214 | . |
| Beans (fresh market) | 448 | . 01 | 1, 291 | . 004 | 304, 617 | . |
| Broccoli | 11, 263 | . 16 | 73, 443 | . 213 | 6, 404, 287 | . |
| Cabbage | 4, 855 | . 07 | 54, 433 | . 158 | 2, 749, 999 | . |
| Carrots | 9, 447 | . 14 | 128, 686 | . 373 | 8, 240, 000 | . |
| Cauliflower | 2, 287 | . 03 | 13, 073 | . 038 | 1, 916, 172 | . |
| Celery | 1, 641 | . 02 | 38, 869 | . 113 | 2, 323, 613 | . |
| Corn, sweet (processing) | 28, 406 | . 41 | 147, 163 | . 426 | 3, 038, 223 | . |
| Corn, sweet (fresh market) | 6, 943 | . 10 | 25, 491 | . 074 | 2, 553, 654 | . |
| Cucumbers | 1, 928 | . 03 | 19, 582 | . 057 | 2, 307, 128 | . |
| Greens (kale, etc.) | 40 | | 26 | | 4, 908 | |
| Lettuce | 68, 588 | 1. 00 | 439, 902 | 1. 275 | 33, 044, 792 | 2. |
| Melons: Cantaloupes, etc | 34, 544 | . 50 | 218, 852 | . 634 | 20, 092, 495 | 1. |
| Honey Ball, honeydew, etc | 4, 792 | . 07 | 42, 925 | . 124 | 2, 751, 893 | . |
| Watermelons | 6, 810 | . 10 | 61, 084 | . 177 | 2, 145, 089 | |
| Onions, dry | 16, 097 | . 23 | 265, 380 | . 769 | 13, 751, 397 | 1. |
| Onions, green | 235 | | 1, 929 | . 006 | 96, 281 | |
| Peas, green (processing) | 12, 105 | . 18 | 20, 016 | . 058 | 1, 614, 901 | |
| Peas, green (fresh market) | 1, 567 | . 02 | 3, 648 | . 011 | 694, 926 | |
| Peppers (all kinds) | 4, 266 | . 06 | 12, 893 | . 037 | 3, 374, 991 | |
| Potatoes, early | 50, 011 | . 73 | 669, 018 | 1. 939 | 17, 068, 318 | 1 |
| Potatoes, late | 232, 934 | 3. 38 | 2, 617, 069 | 7. 584 | 47, 690, 494 | 4 |
| Squash | 2, 267 | . 03 | 20, 056 | . 058 | 1, 540, 416 | |
| Sweet Potatoes | 586 | . 01 | 2, 628 | . 008 | 259, 928 | |
| Tomatoes (canning) | 16, 811 | . 25 | 274, 488 | . 795 | 8, 067, 134 | |
| Tomatoes (fresh market) | 6, 742 | . 10 | 101, 917 | . 295 | 11, 381, 508 | 1 |
| Other vegetables | 6, 091 | . 09 | 45, 959 | . 133 | 3, 711, 626 | |
| Total Vegetables | 561, 199 | 8. 15 | 5, 346, 926 | 15. 496 | 205, 631, 832 | 18 |

**See footnotes at end of table.**

TABLE 7.—*Acreage, production, and gross crop value by crops and types of crops—1961*—Continued

| Crops | Irrigated lands |  | Tonnage |  | Gross crop value |  |
|---|---|---|---|---|---|---|
|  | Total | Percent of total | Total | Percent of total | Total | Percent of total [1] |
|  | *Acres* | *Percent* | *Tons* | *Percent* | *Dollars* | *Percent* |
| otal Nursery | 3,617 | 0.05 |  |  | 9,260,458 | 0.83 |
| eeds: |  |  |  |  |  |  |
| Alfalfa | 75,435 | 1,10 | 16,679 | .048 | 10,581,752 | .95 |
| Clover (all kinds) | 20,996 | .30 | 4,914 | .014 | 2,837,071 | .26 |
| Corn | 9,283 | .13 | 10,913 | .032 | 1,725,022 | .15 |
| Flaxseed | 11,263 | .16 | 11,375 | .033 | 1,355,455 | .12 |
| Grass (all kinds) | 18,265 | .27 | 4,155 | .012 | 2,886,325 | .26 |
| Lettuce | 807 | .01 | 171 |  | 179,540 | .02 |
| Onion | 601 | .01 | 130 |  | 225,355 | .02 |
| Pea | 37,665 | .55 | 41,286 | .120 | 3,156,108 | .28 |
| Potato (all kinds) | 1,042 | .01 | 10,742 | .031 | 660,059 | .06 |
| Sugarbeet | 2,746 | .04 | 4,804 | .014 | 1,440,415 | .13 |
| Other seed | 15,568 | .23 | 9,872 | .029 | 2,009,514 | .18 |
| Total Seeds | 193,671 | 2.81 | 115,041 | .333 | 27,056,616 | 2.43 |
| ruits: |  |  |  |  |  |  |
| Apples | 47,077 | .68 | 327,535 | .949 | 33,180,594 | 2.98 |
| Apricots | 9,690 | .14 | 49,818 | .144 | 3,741,806 | .34 |
| Berries (all kinds) | 2,950 | .04 | 9,916 | .029 | 3,477,555 | .31 |
| Cherries | 6,990 | .10 | 18,317 | .053 | 5,875,600 | .53 |
| Citrus: Grapefruit | 16,525 | .24 | 124,963 | .362 | 5,197,935 | .47 |
| Lemons and limes | 13,322 | .19 | 143,076 | .415 | 7,374,540 | .66 |
| Oranges and tangerines | 38,006 | .55 | 208,832 | .605 | 24,832,137 | 2.23 |
| Dates | 3,806 | .06 | 15,724 | .045 | 5,149,671 | .46 |
| Grapes, table | 57,377 | .83 | 300,544 | .871 | 27,798,921 | 2.49 |
| Grapes, other | 38,755 | .56 | 332,160 | .963 | 15,927,745 | 1.43 |
| Olives | 8,570 | .13 | 12,657 | .037 | 2,286,549 | .20 |
| Peaches | 24,315 | .36 | 147,629 | .428 | 10,634,999 | .95 |
| Pears | 26,796 | .39 | 178,516 | .517 | 14,620,197 | 1.31 |
| Prunes and plums | 13,147 | .19 | 67,542 | .196 | 7,708,926 | .69 |
| Other fruits | 4,884 | .07 | 14,159 | .041 | 2,150,626 | .19 |
| Total Fruits | 312,210 | 4.53 | 1,951,387 | 5.655 | 169,957,801 | 15.24 |
| uts: |  |  |  |  |  |  |
| Almonds | 9,231 | .13 | 6,993 | .020 | 3,694,284 | .33 |
| Pecans | 5,219 | .08 | 2,158 | .006 | 1,296,921 | .12 |
| Walnuts | 6,162 | .09 | 4,050 | .012 | 1,804,772 | .16 |
| Other nuts | 7 |  | 2 |  | 690 |  |
| Total Nuts | 20,619 | .30 | 13,203 | .038 | 6,796,667 | .61 |
| mily Gardens and Orchards | 21,664 | .31 |  |  | 4,693,662 | .42 |
| Total All Crops | 7,293,524 | 105.91 | 34,505,612 | 100.000 | 1,084,936,767 | 97.31 |
| ss Multiple Cropped | 579,388 | 8.41 |  |  |  |  |
| Total Harvested Cropland and Pasture | 6,714,136 | 97.50 |  |  |  |  |
| opland Not Harvested | 131,277 | 1.91 |  |  |  |  |
| il building | 40,571 | .59 |  |  |  |  |
| res Irrigated | 6,885,984 | 100.00 |  |  |  |  |
| ditional Revenues [2] |  |  |  |  | 29,939,694 | 2.69 |
| Total Gross Crop Value |  |  |  |  | 1,114,876,461 | 100.00 |
| ll Irrigation Service | 3,498,449 | 50,81 |  |  | 567,005,736 | 50.86 |
| pplemental Irrigation Service | 3,339,271 | 48.49 |  |  | 539,513,698 | 48.39 |
| mporary Irrigation Service | 48,264 | .70 |  |  | 8,357,027 | .75 |

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Additional revenues are included in computing percentages.
Includes payments received from Federal and commercial agencies.

TABLE 8.—*Irrigation and gross crop value data, by projects, for each State, 1961*

| State and project | Irrigable area for service | | | | Irrigated area | Gross crop value | |
|---|---|---|---|---|---|---|---|
| | Full | Supplemental | Temporary | Total | | Amount | Per irrigated acre |
| | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Dollars* | *Dollars* |
| Arizona: | | | | | | | |
| Gila | 103, 449 | | | 103, 449 | 76, 863 | 15, 887, 107 | 206. 69 |
| Salt River | 238, 213 | 95, 730 | | 333, 943 | 227, 038 | 68, 154, 338 | 300. 19 |
| Yuma (see also California) | 51, 936 | | | 51, 936 | 45, 149 | 25, 798, 698 | 571. 41 |
| Yuma Auxiliary | 3, 406 | | | 3, 406 | 3, 077 | 1, 043, 038 | 338. 98 |
| Total—Arizona | 397, 004 | 95, 730 | | 492, 734 | 352, 127 | 110, 883, 181 | 314. 90 |
| California: | | | | | | | |
| Boulder Canyon | 608, 530 | | | 608, 530 | 490, 406 | 135, 725, 557 | 276. 76 |
| Cachuma | 500 | 26, 610 | | 27, 110 | 10, 578 | 8, 082, 582 | 764. 09 |
| Central Valley | 35, 707 | 822, 928 | 32, 175 | 890, 810 | 744, 672 | 206, 450, 478 | 277. 24 |
| Klamath (see also Oregon | 80, 632 | | | 80, 632 | 78, 013 | 9, 393, 379 | 120. 41 |
| Orland | 19, 811 | | | 19, 811 | 17, 211 | 1, 552, 728 | 90. 22 |
| Santa Maria | | 35, 200 | | 35, 200 | 30, 651 | 30, 527, 571 | 995. 97 |
| Solano | | 39, 744 | | 39, 744 | 31, 011 | 8, 195, 387 | 264. 27 |
| Ventura River | 672 | 3, 797 | | 4, 469 | 2, 280 | 2, 064, 092 | 905. 31 |
| Yuma (see also Arizona) | 14, 620 | | | 14, 620 | 10, 960 | 2, 457, 511 | 224. 23 |
| Total—California | 760, 472 | 928, 279 | 32, 175 | 1, 720, 926 | 1, 415, 782 | 404, 449, 285 | 285. 67 |
| Colorado: | | | | | | | |
| Colorado-Big Thompson | | 720, 000 | | 720, 000 | 720, 000 | 78, 166, 238 | 108. 56 |
| Fruitgrowers Dam | | 2, 662 | | 2, 662 | 1, 772 | 252, 351 | 142. 41 |
| Grand Valley | 34, 686 | 7, 995 | | 42, 681 | 35, 049 | 6, 647, 440 | 189. 66 |
| Mancos | | 8, 650 | | 8, 650 | 7, 434 | 351, 880 | 47. 33 |
| Paonia | | 13, 070 | | 13, 070 | 8, 991 | 2, 035, 849 | 226. 43 |
| Pine River (see also New Mexico) | | 40, 111 | | 40, 111 | 34, 871 | 1, 325, 213 | 38. 00 |
| Pine River Indian Irrigation | | 13, 000 | | 13, 000 | 9, 932 | 429, 138 | 43. 21 |
| Uncompahgre | 76, 447 | | | 76, 447 | 63, 372 | 5, 425, 402 | 85. 61 |
| Total—Colorado | 111, 133 | 805, 488 | | 916, 621 | 881, 421 | 94, 633, 511 | 107. 36 |
| Idaho: | | | | | | | |
| Avondale | 873 | | | 873 | 513 | 26, 842 | 52. 32 |
| Boise (see also Oregon) | 223, 065 | 136, 115 | | 359, 180 | 321, 345 | 43, 452, 087 | 135. 22 |
| Dalton Gardens | 944 | | | 944 | 692 | 49, 588 | 71. 66 |
| Lewiston Orchards | 3, 595 | | | 3, 595 | 1, 932 | 584, 939 | 302. 76 |
| Little Wood River | | 9, 549 | | 9, 549 | 6, 097 | 337, 159 | 55. 30 |
| Michaud Flats | 9, 720 | | | 9, 720 | 9, 017 | 1, 286, 042 | 142. 62 |
| Minidoka | 214, 642 | 945, 354 | 360 | 1, 160, 356 | 1, 078, 224 | 109, 750, 578 | 101. 79 |
| Owyhee (see also Oregon) | 33, 360 | | | 33, 360 | 31, 274 | 4, 764, 794 | 152. 36 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Total—Idaho | 491, 209 | 1, 095, 518 | 360 | 1, 587, 087 | 1, 457, 119 | 160, 988, 450 | 110. 48 |
| Kansas: | | | | | | | |
| Missouri River Basin: | | | | | | | |
| Bostwick Division: | | | | | | | |
| Kansas Bostick I. D. (see also Nebraska) | 36, 413 | | | 36, 413 | 21, 962 | 1, 313, 308 | 59. 80 |
| Kirwin Unit | 11, 500 | | | 11, 500 | 7, 551 | 702, 229 | 93. 00 |
| Webster Unit | 8, 500 | | | 8, 500 | 2, 912 | 302, 049 | 103. 73 |
| Total—Kansas | 56, 413 | | | 56, 413 | 32, 425 | 2, 317, 586 | 71. 48 |
| Montana: | | | | | | | |
| Bitter Root | 16, 665 | | | 16, 665 | 16, 002 | 727, 984 | 45. 49 |
| Buffalo Rapids | 22, 938 | | | 22, 938 | 21, 264 | 1, 817, 441 | 85. 47 |
| Frenchtown | 4, 810 | | | 4, 810 | 3, 975 | 238, 375 | 59. 96 |
| Huntley | 32, 447 | | | 32, 447 | 24, 244 | 1, 757, 150 | 72. 48 |
| Intake | 881 | | | 881 | 806 | 46, 116 | 57. 22 |
| Lower Yellowstone (see also North Dakota) | 34, 554 | | | 34, 554 | 29, 862 | 3, 007, 713 | 100. 72 |
| Milk River | 118, 391 | | | 118, 391 | 87, 590 | 3, 970, 084 | 45. 33 |
| Missoula Valley | 977 | | | 977 | 668 | 28, 761 | 43. 06 |
| Missouri River Basin: | | | | | | | |
| Helena Valley Unit | 14, 121 | | | 14, 121 | 8, 839 | 401, 739 | 45. 45 |
| Crow Creek Pump Unit | 4, 545 | | | 4, 545 | 3, 452 | 302, 405 | 87. 60 |
| Savage Unit | 2, 215 | | | 2, 215 | 1, 997 | 117, 178 | 58. 68 |
| Sun River | 91, 797 | | | 91, 797 | 68, 069 | 3, 009, 829 | 44. 22 |
| Total—Montana | 344, 341 | | | 344, 341 | 266, 768 | 15, 424, 775 | 57. 82 |
| Nebraska: | | | | | | | |
| Mirage Flats | 11, 662 | | | 11, 662 | 10, 972 | 1, 177, 882 | 107. 35 |
| Missouri River Basin: | | | | | | | |
| Bostwick Division: | | | | | | | |
| Nebraska Bostwick I. D. (see also Kansas) | 22, 755 | | | 22, 755 | 16, 906 | 1, 430, 531 | 84. 62 |
| Frenchman-Cambridge Division: | | | | | | | |
| Frenchman-Cambridge I.D | 38, 640 | | | 38, 640 | 31, 818 | 3, 009, 844 | 94. 60 |
| Frenchman Valley I. D | | 9, 600 | | 9, 600 | 8, 109 | 558, 562 | 68. 88 |
| H & R W Irrigation District | 4, 355 | | | 4, 355 | 3, 537 | 229, 743 | 64. 95 |
| Glendo Unit (see also Wyoming) | | 22, 524 | | 22, 524 | 17, 684 | 2, 375, 852 | 134. 35 |
| Sargent Unit | 12, 900 | | | 12, 900 | 7, 936 | 604. 173 | 76. 13 |
| North Platte (see also Wyoming) | 171, 964 | 92, 398 | | 264, 362 | 242, 968 | 28, 753, 995 | 118. 34 |
| Total—Nebraska | 262, 276 | 124, 522 | | 386, 798 | 339, 930 | 38, 140, 582 | 112. 20 |
| Nevada: | | | | | | | |
| Humboldt | | 39, 623 | | 39, 623 | 16, 443 | 1, 139, 332 | 69. 29 |
| Newlands | 72, 054 | | | 72, 054 | 50, 417 | 2, 989, 470 | 59. 29 |
| Truckee Storage | | 28, 755 | | 28, 755 | 20, 010 | 1, 031, 552 | 51. 55 |
| Total—Nevada | 72, 054 | 68, 378 | | 140, 432 | 86, 870 | 5, 160, 354 | 59. 40 |

See footnotes at end of table.

TABLE 8.—*Irrigation and gross crop value data, by projects, for each State, 1961*—Continued

| State and project | Irrigable area for service | | | | Irrigated area | Gross crop value | |
|---|---|---|---|---|---|---|---|
| | Full | Supplemental | Temporary | Total | | Amount | Per irrigated acre |
| | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Dollars* | *Dollars* |
| New Mexico: | | | | | | | |
| Carlsbad | 25,055 | | | 25,055 | 20,970 | 5,054,636 | 241.04 |
| Fort Sumner | 6,500 | | | 6,500 | 5,442 | 388,902 | 71.46 |
| Middle Rio Grande | 121,680 | | | 121,680 | 53,147 | 4,422,370 | 83.21 |
| Pine River (see also Colorado) | | | 1,030 | 1,030 | 625 | 18,950 | 30.32 |
| Rio Grande (see also Texas) | 102,082 | | | 102,082 | 85,388 | 23,635,842 | 276.80 |
| Tucumcari | 41,397 | | | 41,397 | 34,398 | 1,739,550 | 50.57 |
| Vermejo | 7,379 | | | 7,379 | 6,436 | 129,292 | 20.09 |
| Total—New Mexico | 304,093 | | 1,030 | 305,123 | 206,406 | 35,389,532 | 171.46 |
| North Dakota: | | | | | | | |
| Buford-Trenton | 7,655 | | | 7,655 | 7,079 | 700,407 | 98.94 |
| Lower Yellowstone (see also Montana) | 17,696 | | | 17,696 | 16,179 | 1,469,447 | 90.82 |
| Missouri River Basin: | | | | | | | |
| Dickinson Unit | 400 | | | 400 | 293 | 37,572 | 128.23 |
| Heart Butte Unit | 2,463 | | | 2,463 | 1,906 | 127,984 | 67.15 |
| Fort Clark Unit | 2,039 | | | 2,039 | 1,299 | 78,031 | 60.07 |
| Total—North Dakota | 30,253 | | | 30,253 | 26,756 | 2,413,441 | 90.20 |
| Oklahoma: | | | | | | | |
| W. C. Austin | 47,809 | | | 47,809 | 42,001 | 7,161,300 | 170.50 |
| Total—Oklahoma | 47,809 | | | 47,809 | 42,001 | 7,161,300 | 170.50 |
| Oregon: | | | | | | | |
| Arnold | 4,292 | | | 4,292 | 3,087 | 118,471 | 38.38 |
| Baker | | 7,281 | | 7,281 | 7,260 | 373,448 | 51.44 |
| Boise (see also Idaho) | 1,696 | | | 1,696 | 1,278 | 97,347 | 76.17 |
| Burnt River | | 15,616 | | 15,616 | 15,486 | 815,449 | 52.66 |
| Crescent Lake Dam | 6,650 | | | 6,650 | 6,081 | 371,244 | 61.04 |
| Crooked River | 8,500 | | | 8,500 | 8,193 | 648,280 | 79.12 |
| Deschutes | 50,000 | 48,990 | 1,172 | 100,162 | 91,750 | 9,146,704 | 99.69 |
| Grants Pass | 10,370 | | | 10,370 | 7,144 | 673,503 | 94.28 |
| Klamath (see also California) | 135,474 | | | 135,474 | 121,160 | 12,236,464 | 100.99 |
| Owyhee (see also Idaho) | 71,656 | 13,000 | | 84,656 | 78,997 | 14,582,866 | 184.60 |
| Rogue River Basin | | 23,801 | | 23,801 | 20,844 | 5,920,912 | 284.06 |
| Umatilla | 17,859 | 13,015 | 513 | 31,387 | 24,992 | 2,255,741 | 90.26 |
| Vale | 32,000 | | | 32,000 | 29,732 | 2,073,632 | 69.74 |
| Wapinitia | | 2,108 | | 2,108 | 1,686 | 123,473 | 73.23 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Missouri River Basin: | | | | | | | |
| Angostura Unit | 12, 135 | | | 12, 135 | 8, 821 | 336, 672 | 38. 17 |
| Rapid Valley | | 8, 900 | | 8, 900 | 5, 318 | 217, 215 | 40. 85 |
| Total—South Dakota | 69, 318 | 8, 900 | | 78, 218 | 66, 867 | 2, 431, 285 | 36. 36 |
| Texas: | | | | | | | |
| Balmorhea | | 10, 608 | | 10, 608 | 7, 163 | 823, 750 | 115. 00 |
| Rio Grande (see also New Mexico) | 76, 114 | [1] 18, 342 | | [2] 94, 456 | 65, 927 | 19, 907, 847 | 301. 97 |
| Total—Texas | 76, 114 | [2] 28, 950 | | [2] 105, 064 | 73, 090 | 20, 731, 606 | 283. 64 |
| Utah: | | | | | | | |
| Hyrum | | 6, 800 | | 6, 800 | 6, 209 | 388, 420 | 62. 56 |
| Moon Lake | | 75, 256 | | 75, 256 | 42, 167 | 892, 301 | 21. 16 |
| Newton | | 2, 600 | | 2, 600 | 2, 108 | 94, 390 | 44. 78 |
| Ogden River | | 23, 447 | | 23, 447 | 15, 598 | 1, 971, 718 | 126. 41 |
| Provo River | | 48, 156 | | 48, 156 | 37, 398 | 3, 092, 757 | 82. 70 |
| Sanpete | | 13, 694 | | 13, 694 | 11, 844 | 471, 202 | 39. 78 |
| Scofield | | 15, 843 | | 15, 843 | 8, 618 | 388, 350 | 45. 06 |
| Strawberry Valley | 17, 269 | 27, 302 | | 44, 571 | 38, 692 | 2, 991, 554 | 77. 32 |
| Weber River | | 108, 978 | | 108, 978 | 90, 556 | 10, 122, 483 | 111. 78 |
| Total—Utah | 17, 269 | 322, 076 | | 339, 345 | 253, 190 | 20, 413, 175 | 80. 62 |
| Washington: | | | | | | | |
| Chief Joseph Dam | 2, 860 | | | 2, 860 | 1, 423 | 195, 067 | 137. 08 |
| Columbia Basin | 442, 422 | | | 442, 422 | 314, 239 | 41, 663, 398 | 132. 58 |
| Okanogan | 5, 038 | | | 5, 038 | 4, 181 | 809, 896 | 193. 70 |
| Yakima | 279, 922 | 181, 844 | 156 | 461, 922 | 381, 120 | 84, 329, 899 | 221. 27 |
| Total—Washington | 730, 242 | 181, 844 | 156 | 912, 242 | 700, 963 | 126, 998, 260 | 181. 18 |
| Wyoming: | | | | | | | |
| Eden | 17, 022 | | | 17, 022 | 11, 951 | 300, 425 | 25. 14 |
| Kendrick | 23, 957 | | | 23, 957 | 20, 790 | 1, 133, 614 | 54. 53 |
| Missouri River Basin: | | | | | | | |
| Boysen Unit | | | 19, 905 | 19, 905 | 17, 915 | 1, 346, 349 | 75. 15 |
| Glendo Unit (see also Nebraska) | | 8, 732 | | 8, 732 | 5, 789 | 622, 364 | 107. 51 |
| Hanover-Bluff Unit | 6, 527 | | | 6, 527 | 6, 176 | 582, 754 | 94. 36 |
| Owl Creek Unit | | 11, 338 | | 11, 338 | 8, 995 | 428, 270 | 47. 61 |
| North Platte (see also Nebraska) | 54, 359 | 16, 317 | | 70, 676 | 68, 028 | 6, 370, 077 | 93. 64 |
| Riverton | 55, 545 | | | 55, 545 | 49, 505 | 2, 460, 350 | 49. 70 |
| Shoshone | 93, 580 | | | 93, 580 | 77, 430 | 4, 658, 401 | 69. 16 |
| Total—Wyoming | 250, 990 | 36, 387 | 19, 905 | 307, 282 | 266, 579 | 17, 902, 604 | 67. 16 |
| Total—All States | 4, 359, 487 | 3, 819, 883 | 55, 311 | 8, 234, 681 | 6, 885, 984 | 1, 114, 876, 461 | 161. 91 |

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[1] Acreage for which service is available under Warren Act contract.
[2] Includes 18,342 acres for which service is available under Warren Act contract.

TABLE 9.—*Accretions to reclamation fund by States, fiscal year 1962*

| State | Sale of public lands and timber | | Proceeds from Mineral Leasing Act | | Total to June 30, 1962 |
|---|---|---|---|---|---|
| | Fiscal year 1962 | To June 30, 1962 | Fiscal year 1962 | To June 30, 1962 | |
| Alabama | | | $1,223.13 | $218,792.10 | $218,792.1 |
| Arizona | $400,933.21 | $6,820,921.57 | 275,210.89 | 1,894,515.59 | 8,715,437.1 |
| Arkansas | | | 79,433.58 | 231,711.71 | 231,711.7 |
| California | 1,798,208.71 | 19,445,003.89 | 3,541,574.03 | 89,059,606.99 | 108,504,610.8 |
| Colorado | 288,817.73 | 13,137,822.34 | 4,595,869.46 | 61,502,997.94 | 74,640,820.2 |
| Florida | | | 168.65 | 3,656.09 | 3,656.0 |
| Idaho | 403,250.46 | 10,291,475.56 | 141,685.86 | 1,998,278.99 | 12,289,754.5 |
| Illinois | | | | 74.81 | 74.8 |
| Indiana | | | | 84.00 | 84.0 |
| Kansas | | 1,046,576.99 | 211,279.31 | 1,174,236.92 | 2,220,813.9 |
| Louisiana | | | 165,511.60 | 1,671,060.02 | 1,671.060.0 |
| Michigan | | | 8,044.16 | 43,385.37 | 43,385.3 |
| Mississippi | | | 3,944.80 | 37,297.52 | 37,297.5 |
| Montana | 160,028.70 | 17,255,847.20 | 2,459,798.61 | 24,335,310.44 | 41,591,157.6 |
| Nebraska | | 2,223,294.97 | 15,935.43 | 115,292.36 | 2,338,587.3 |
| Nevada | 1,165,540.92 | 5,445,613.39 | 276,540.94 | 4,581,512.49 | 10,027,125.8 |
| New Mexico | 333,227.38 | 8,576,118.33 | 11,742,097.73 | 83,846,977.32 | 92,423,095.6 |
| North Dakota | 537.60 | 12,302,429.78 | 139,286.46 | 1,527,537.50 | 13,829,967.2 |
| Oklahoma | 5,733.60 | 6,087,689.57 | 111,404.60 | 519,334.93 | 6,607,024.5 |
| Oregon | 1,082,763.94 | 21,308,023.56 | 8,644.38 | 437,849.94 | 21,745,873.5 |
| South Dakota | (285.90) | 7,898,205.83 | 71,788.21 | 1,242,803.21 | 9,141,009.0 |
| Utah | 45,568.01 | 5,347,239.59 | 4,058,688.79 | 31,675,368.70 | 37,022,608.2 |
| Washington | 165,118.37 | 10,333,068.78 | 3,718.84 | 101,294.37 | 10,434,363.1 |
| Wyoming | 78,489.34 | 10,050,723.09 | 18,806,865.66 | 213,294,680.71 | 223,345,403.8 |
| Total | 5,927,932.07 | 157,570,054.44 | 46,718,715.12 | 519,513,660.02 | 677,083,714.4 |

| Other accretions | Fiscal year 1962 | Total to June 30, 1962 |
|---|---|---|
| Proceeds, Federal water power licenses | $77,937.91 | $1,884,767.0 |
| Proceeds, potassium royalties and rentals | 1,642,779.88 | 25,012,124.1 |
| Receipts from naval petroleum reserves, 1920–1938, act of May 9, 1938 | | 29,778,300.2 |
| Proceeds from rights-of-way over withdrawn lands, act of July 19, 1919 | 1,442.40 | 17,270.0 |
| Miscellaneous mineral leasing permits | 460.00 | 1,077.2 |
| Miscellaneous items, other | | 5.7 |
| Total | 1,722,620.19 | 56,693,544.5 |
| Grand total | 54,369,267.38 | 733,777,259.0 |

TABLE 10.—*The reclamation fund, funds available for appropriation, fiscal years 1961-1962*

| Receipts and appropriations | Actual 1961 | Actual 1962 |
|---|---|---|
| Unappropriated balance brought forward (as of June 30) | $119,663,735 | $117,711,983 |
| Collections: | | |
| Bureau of Reclamation: | | |
| Power revenues | 49,302,725 | 49,860,951 |
| All other | 20,034,338 | 18,750,246 |
| Other agencies | 51,491,613 | 54,369,268 |
| Total collections | 120,828,676 | 122,980,465 |
| Expired and lapsed appropriations | 2,048,572 | 3,767,017 |
| Total available for appropriation | 242,540,983 | 244,459,465 |
| Annual appropriations: | | |
| General Investigations | 3,943,000 | 5,520,000 |
| Construction and Rehabilitation | 90,000,000 | 67,400,000 |
| Operation and Maintenance | 26,496,000 | 30,687,000 |
| General Administrative Expenses | 4,290,000 | 9,430,000 |
| Emergency Fund | | 1,000,000 |
| Total annual appropriations | 124,729,000 | 114,037,000 |
| Permanently authorized appropriations: | | |
| Refunds and Returns | 92,000 | |
| Farmers Irrigation District, North Platte Project | 8,000 | 8,000 |
| Total appropriations | 124,829,000 | 114,045,000 |
| Unappropriated balance carried forward | 117,711,983 | 130,414,465 |

# *Bonneville Power Administration*

## Charles F. Luce, *Administrator*

President Franklin Delano Roosevelt on August 20, 1937, signed the Bonneville Project Act, marking the birth of Bonneville Power Administration. With a stroke of his pen, he heralded an unparalleled quarter century of Pacific Northwest hydroelectric and economic growth.

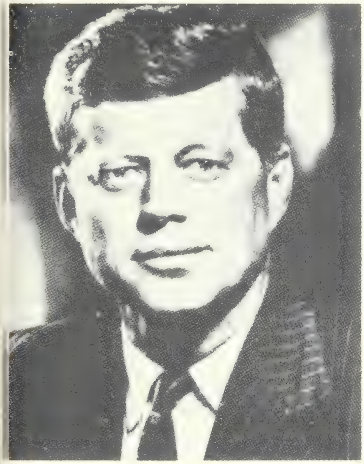
Today, no other single river basin in the world surpasses the hydroelectric development of the Columbia River power system. Bonneville Power Administration's utility operations, serve an area of 220,000 square miles covering Oregon, Washington, Northern Idaho, Western Montana and a small corner of Nevada, with a rapidly growing population already in excess of 5,000,000 people.

Bonneville Power Administration delivered the first generation from Bonneville Dam to the City of Cascade Locks, Oregon, on July 9, 1938. Since that time, BPA has been designated the marketing agency for 20 Federal multipurpose projects in the Columbia River Basin, including 16 Corps of Engineers and 4 Bureau of Reclamation projects.

### *Public Benefits*

Power revenues will repay about 80 percent of the total investment in the Columbia River system of multipurpose dams in addition to substantial irrigation assistance and all operating costs. The inclusion of power facilities makes possible the tremendous public benefits that come from flood control, navigation, recreation, and irrigation. Multipurpose development is made feasible by the inclusion

# Letter From President Kennedy on the 25th Anniversary of Bonneville Power Administration.



August 20, 1962

When you help build a region, you help build your nation. This is the real significance of Bonneville Power Administration's first 25 years.

The Bonneville Project Act, signed 25 years ago by President Franklin D. Roosevelt, expressed the aspirations of the Pacific Northwest with respect to its unique endowment of water resources. It foresaw what wide distribution of electric power at low cost could do for the region and the nation, and it provided the vehicle to accomplish this goal.

Today the evidence is all around us. People of the Pacific Northwest use more electricity--for their homes, their farms, their businesses, their industries--than the residents of any other region. More than 99 percent of the area's farms are electrified. Northwest industry has built and thrived and expanded on Columbia River power. Electric rates of all utilities, public and private, in the Bonneville marketing area are some of the lowest in the nation.

Other regions also have benefited. The economic growth of the Pacific Northwest has created a bigger market for Detroit cars and Pittsburgh steel and Boston shoes and Atlanta textiles. The list is almost without end, and proves again that the economic vitality of one region affects the economic vitality of all other regions.

Twice in Bonneville's relatively short life-span our nation has been required to fight wars to preserve freedom. On each occasion, Bonneville's great hydro and transmission resources played an important role in victory.

Bonneville's first 25 years point the way to ever bigger contributions to the economic growth and prosperity and security of our nation.

The job of developing the hydroelectric potential of the Columbia River system is less than half done. May the past achievements of the Bonneville Power Administration serve as an inspiration to get on with the job in the years ahead.

of power which carries a large share of the costs of the dams and reservoirs.

## *Generation Added*

Ice Harbor Dam on the Snake with 270,000 kilowatts of installed capacity, and Hills Creek Dam on the Middle Fork of the Willamette, with 30,000 kilowatts, were completed during fiscal year 1962. This brought the nameplate rating of the Columbia River power system to 6,489,250 kilowatts. Projects under construction will increase the nameplate rating to 8,379,250, and construction of three authorized projects would bring the total to 9,533,250.

Federal reservoir storage usable for power, was increased to 10,456,000 acre-feet with addition of the 249,000 acre-feet at Hills Creek. Cougar and Green Peter, now under construction in the Willamette Basin, will add 487,000 acre-feet. Libby, an authorized project, would provide 5,010,000 acre-feet but construction is conditional on final ratification of the Canadian Treaty.

Projects existing, under construction and authorized are shown in table I.

## *Non-Federal Generation*

Non-Federal generation in the area served by Bonneville Power Administration increased by addition of 772,300 kilowatts of installed capacity during fiscal year 1962, bringing the total non-Federal capacity to 5,127,850 kilowatts.

Future additions under construction or licensed would add about 3,054,000 kilowatts.

## *Northwest Power Pool*

During fiscal year 1962 Bonneville Power Administration supplied 52.6 percent of the total energy generated by the major utilities of the region and 48.5 percent of the net requirements of the Northwest Power Pool. Generation by principal electric utility systems of the region is shown in the Northwest Power Pool chart.

## *Third of a Trillion*

Bonneville Power Administration since beginning of operations in 1938 has sold over a third of a trillion kilowatt hours of hydroelectric energy. This would be enough to meet the current power requirements of the City of Seattle for 95 years or of the entire United States for 8 months.

Increasing by 2.2 percent over the previous year, fiscal year 1962 power sales totaled 29.2 billion kilowatt hours for $68,900,000, an average of 2.36 mills per kilowatt hour.

*general specifications, projects existing, under construction and authorized June 30, 1962*

| Project | Operating agency [1] | Location | Stream | Plant installations: Number of units | Plant installations: Total capacity kilowatts [2] | Date in service (initial unit) | Generation fiscal year 1962 [3] |
|---|---|---|---|---|---|---|---|
| **Existing:** | | | | | | | |
| Bonneville | CE | Washington-Oregon | Columbia | 10 | 518, 400 | June 1938 | 3, 461 |
| Grand Coulee | BR | Washington | do | 18 | 1, 944, 000 | September 1941 | 11, 433 |
| Hungry Horse | BR | Montana | South Fork Flathead | 4 | 285, 000 | October 1952 | 796 |
| Detroit | CE | Oregon | North Santiam | 2 | 100, 000 | July 1953 | 338 |
| McNary | CE | Washington-Oregon | Columbia | 14 | 980, 000 | November 1953 | 4, 859 |
| Big Cliff | CE | Oregon | North Santiam | 1 | 18, 000 | June 1954 | 97 |
| Lookout Point | CE | do | Middle Fork Willamette | 3 | 120, 000 | December 1954 | 223 |
| Albeni Falls | CE | Idaho | Pend Oreille | 3 | 42, 600 | March 1955 | 176 |
| Dexter | CE | Oregon | Middle Fork Willamette | 1 | 15, 000 | May 1955 | 58 |
| Chief Joseph | CE | Washington | Columbia | 16 | 1, 024, 000 | August 1955 | 4, 446 |
| Chandler | BR | do | Yakima | 2 | 12, 000 | February 1956 | 40 |
| The Dalles | CE | Washington-Oregon | Columbia | 16 | 1, 119, 000 | May 1957 | 4, 985 |
| Roza | BR | Washington | Yakima | 1 | 11, 250 | August 1958 | 50 |
| Ice Harbor | CE | do | Snake | 3 | 270, 000 | December 1961 | 537 |
| Hills Creek | CE | Oregon | Middle Fork Willamette | 2 | 30, 000 | May 1962 | 11 |
| Subtotal | | | | | 6, 489, 250 | | 31, 510 |
| **Under construction:** | | | | | | | |
| Cougar | CE | Oregon | South Fork McKenzie | 2 | 25, 000 | November 1963 | |
| Green Peter | CE | do | Middle Santiam | 2 | 80, 000 | April 1966 | |
| Foster | CE | do | South Santiam | 2 | 30, 000 | April 1967 | |
| John Day | CE | Washington-Oregon | Columbia | 10 | 1, 350, 000 | June 1967 | |
| Lower Monumental | CE | Washington | Snake | 3 | 405, 000 | December 1967 | |
| Subtotal | | | | | 1, 890, 000 | | |
| **Authorized:** | | | | | | | |
| Libby | CE | Montana | Kootenai | 4 | 344, 000 | | |
| Little Goose | CE | Washington | Snake | 3 | 405, 000 | | |
| Lower Granite | CE | do | do | 3 | 405, 000 | | |
| Subtotal | | | | | 1, 154, 000 | | |
| Total, 23 projects | | | | | 9, 533, 250 | | |

[1] CE—Corps of Engineers; BR—Bureau of Reclamation.
[2] Nameplate rating.
[3] Millions of kilowatt-hours.

TABLE II.—*Electric energy account for fiscal year 1962*

| | |
|---|---|
| Energy received (millions of kilowatt-hours): | |
| Energy generated for BPA: | |
| Bureau of Reclamation | 12, 318 |
| Corps of Engineers | 19, 192 |
| Power interchanged in | 12, 320 |
| Total received | 43, 830 |
| Energy delivered (millions of kilowatt-hours): | |
| Sales | 29, 157 |
| Power interchanged out | 12, 649 |
| Used by Administration | 37 |
| Total delivered | 41, 843 |
| Energy losses in transmission and transformation | 1, 987 |
| Losses in percent of total received—percent | 4. 5 |
| Maximum demand on Federal plants (kilowatts) February 27, 1962, 9–10 a.m., PST | 4, 967, 000 |
| Load factor, total generated for BPA, percent | 72. 4 |

Percentage distribution by classes of customers for fiscal year 1962 follow:

| | *Number of customers, June 1962* | *Energy sale by percent of total* |
|---|---|---|
| Publicly owned utilities | 82 | 43. 4 |
| Privately owned utilities | 8 | 10. 8 |
| Aluminum industry | 9 | 30. 1 |
| Other industries and Federal agencies | 20 | 15. 7 |
| Total | 119 | 100. 0 |

## *Trend of Sales*

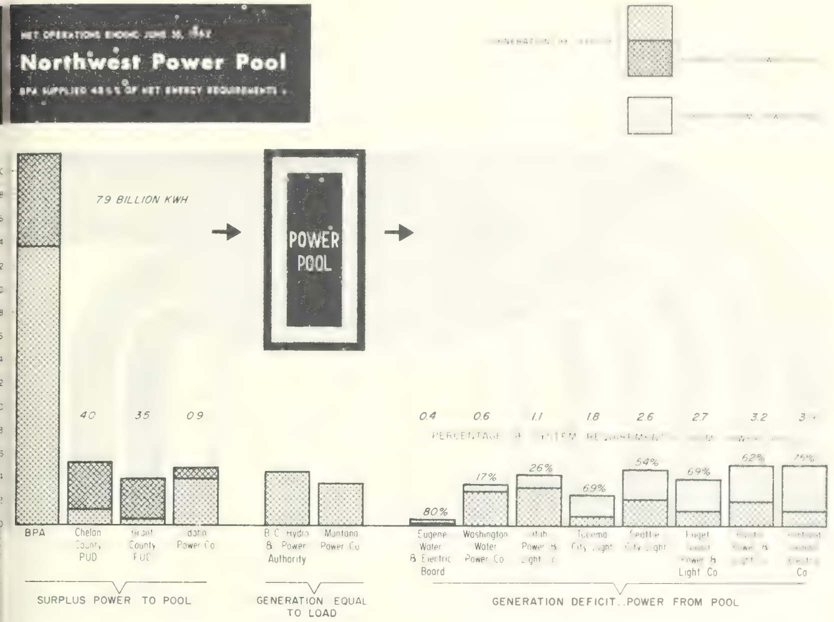
Sales to publicly owned utilities continued to increase at a higher rate than other classes of customers, for an average of 16.4 percent a year or 164 percent during the last 10-year period.

Total energy sales during the same 10-year period increased 71 percent, private utility sales decreased 17 percent, sales to aluminum companies increased 35 percent and combined sales to Federal agencies and other industries, increased 135 percent.

Comparative energy sales by classes of customers for 1961 and 1962 are shown in table III. Growth of sales since beginning of operations are graphically illustrated in the chart entitled Sales of Electric Energy by Classes of Customers.

## *Basic Power Rate Holds*

Bonneville Power Administration's famed "Postage Stamp" rate of $17.50 per kilowatt year has been in effect since beginning of



erations nearly a quarter century ago. The current rate will ntinue until at least December 20, 1964, date of the next 5-year te review and adjustment period specified in the Bonneville Act.

TABLE III.—*Sales of electric energy by classes of customers*

| | Fiscal year 1962 | | Fiscal year 1961 | | Percent increase |
|---|---|---|---|---|---|
| | Millions of kilowatt-hours | Mills per kilowatt-hour | Millions of kilowatt-hours | Mills per kilowatt-hour | |
| blicly owned utilities: | | | | | |
| Firm | 12, 131 | 2. 69 | 10, 876 | 2. 72 | 11. 5 |
| Nonfirm | 536 | 2. 50 | 198 | 2. 50 | 170. 7 |
| Total | 12, 667 | 2. 68 | 11, 074 | 2. 71 | 14. 4 |
| vately owned utilities: | | | | | |
| Firm | 2, 607 | 2. 13 | 3, 629 | 2. 24 | −28. 2 |
| Nonfirm | 554 | 2. 50 | 673 | 2. 50 | −17. 7 |
| Total | 3, 161 | 2. 19 | 4, 302 | 2. 28 | −26. 5 |
| minum plants: | | | | | |
| Firm | 7, 046 | 2. 03 | 7, 431 | 2. 01 | −5. 2 |
| Nonfirm | 1, 719 | 1. 78 | 1, 128 | 1. 76 | 52. 4 |
| Total | 8, 765 | 1. 98 | 8, 559 | 1. 98 | 2. 4 |
| er industries: [1] | | | | | |
| Firm | 4, 074 | 2. 31 | 4, 193 | 2. 24 | −2. 8 |
| Nonfirm | 490 | 2. 22 | 393 | 2. 26 | 24. 7 |
| Total | 4, 564 | 2. 30 | 4, 586 | 2. 26 | −0. 5 |
| al energy: | | | | | |
| Firm | 25, 858 | 2. 39 | 26, 129 | 2. 37 | −1. 0 |
| Nonfirm | 3, 299 | 2. 09 | 2, 392 | 2. 11 | 37. 9 |
| Total | 29, 157 | 2. 36 | 28, 521 | 2. 35 | 2. 2 |

---

[1] Includes Federal agencies.

BPA delivered about 64 percent of its energy sales—at an average cost of 2.18 mills per kilowatt-hour—to industries and to utilities having substantial generating facilities. A summary of energy sales for the fiscal year, classified by rate schedules, appears in table IV.

## *Industrial Use*

Bonneville's industrial customers have, in the aggregate, an estimated capacity to use power at the rate of approximately 1,900,000 kilowatts per year. As of June 30, 1962, their power purchases from the Government and from other sources totaled 1,499,000 kilowatts, leaving idle plant capacity of about 401,000 kilowatts. Firm deliveries from the Government directly to industrial customers were 999,000 kilowatts, interruptible deliveries were 282,000 kilowatts. These industries purchased the remaining 218,000 kilowatts from non-Federal sources.

## *Low Cost Power*

The Pacific Northwest, largely due to abundant low cost power from the Federal system, has a residential and farm use 2½ times the national average and pays one-half the national average price. Present farm and home use in the region is somewhat over 10,000 kilowatt-hours per customer per year and the average cost about 1.25 cents per kilowatt-hour.

TABLE IV.—*Sales of electric energy by rate schedules—fiscal year 1962*

| Rate schedule | Millions of kilowatt-hours | Percent of total | Percent change from fiscal year 1961 | Mills per kilowatt-hour |
|---|---|---|---|---|
| C-4 [1] | 18, 566 | 63. 7 | −3. 0 | 2. 1 |
| F-4 | 34 | 0. 1 | −34. 3 | 5. 0 |
| A-4 [1] | 2, 658 | 9. 1 | 12. 0 | 1. 6 |
| E-4 [1] | 6, 679 | 22. 9 | 11. 9 | 3. 1 |
| H-3 | 1, 197 | 4. 1 | 24. 2 | 2. 5 |
| Space heating | 23 | 0. 1 | 64. 3 | 1. 0 |
| Total | 29, 157 | 100. 0 | 2. 2 | 2. 3 |

Major features of rate schedules:

| | |
|---|---|
| C-4 | Kilowatt-year rate for transmission system firm power. |
| F-4 | Demand-energy rate for firm power. |
| A-4 | Kilowatt-year rate for at-site firm power. |
| E-4 | Demand-energy rate for firm power for resale to ultimate consumers. |
| H-3 | Energy rate for dump, emergency, breakdown, or experimental service. |
| Space heating | Special space heating rate applicable in vicinity of Grand Coulee plant |

[1] Includes interruptible sales.

## *Transmission System*

Bonneville Power Administration in a little over two decades has constructed one of the Nation's largest high voltage grid systems to carry power from the Columbia River power system and from large non-Federal projects to the region's load centers.

Addition of 384 circuit miles of high voltage transmission lines and 7 substations during fiscal year 1962 gives the Administration a network of 8,608 circuit miles of transmission line and 215 substations.

Transformer capacity was increased by 113,000 kilovolt amperes for a total of 14,585,747 kilovolt amperes, and the present system reactive capacitance of 2,538,670 kilovolt amperes was increased by 03,125 kilovolt amperes during the fiscal year.

*A lineman tightens the guys on a new type of steel H-frame transmission structure carrying power from the Cougar Dam in the Willamette Basin to lower Willamette Valley load centers.*

## *New Facilities Completed*

Major facilities completed during the year were:

— An 80-mile, 345,000 volt line from Big Eddy substation near The Dalles, Oregon to Portland General Electric Company's McLoughlin substation southeast of Portland, Oreg., to increase transmission capacity into the Willamette Valley area from Mid-Columbia river generating plants.

— A 129-mile, 345,000 volt line from Chelan County Public Utility District's Rocky Reach hydroelectric project to Maple Valley near Seattle, Wash., to bring additional power to northwestern Washington.

— A 9-mile, double circuit 115,000 volt line to integrate the output of the Corps of Engineers' Ice Harbor hydroelectric project, on the lower Snake River, into the BPA system near Pasco, Wash.

— A 125-mile, 115,000 volt line between our Redmond, Oreg., substation and Harney Electric Cooperative near Burns, Oreg., to bring electric power service to presently unserved areas in southern Harney and Malheur Counties, Oreg., and northern Humboldt County, Nev.

— A 50,000 kilovolt ampere transformer addition to the Aberdeen substation to serve load growth in the Grays Harbor area of Washington.

## *Construction Under Way*

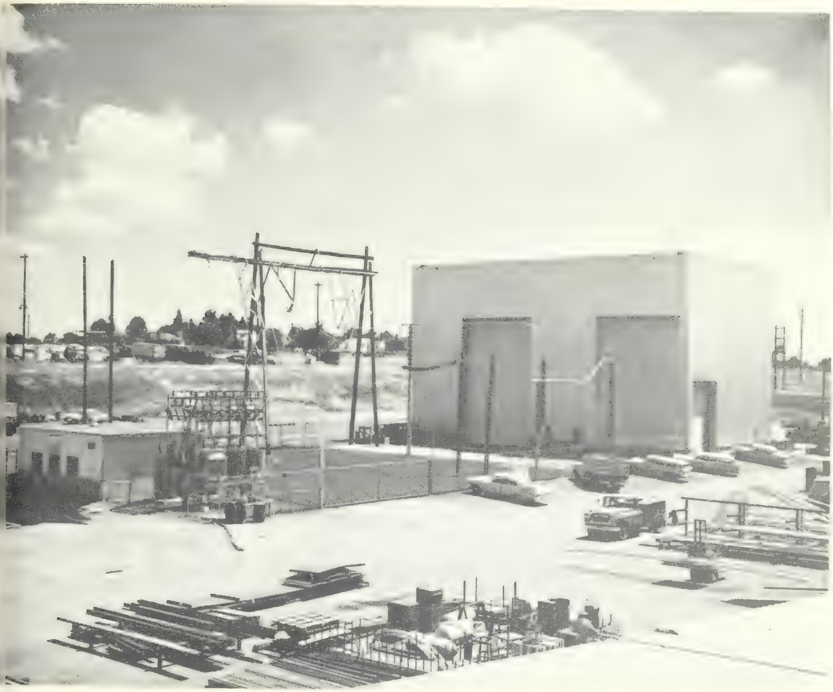
Construction under way on key facilities at the end of the fiscal year included:

An 18-mile, 115,000 volt line from the Administration's Lebanon substation, initially to furnish construction power to the Corps of Engineers' Green Peter Dam in western central Oregon, and later to integrate generation from the dam into the BPA grid.

The Vantage Substation and 230,000-volt tap to the Midway-Columbia line to integrate the Wanapum project of the Grant County Public Utility District with the Administration's grid under long-term "wheeling" agreements.

A second 33-mile, 230,000-volt line between Chehalis and Longview, Wash., to reinforce the Administration's system in the Longview area of southwestern Washington.

A 46-mile, 115,000-volt line between Eugene, Oreg., and the Corps of Engineers Cougar project on the South Fork of the McKenzie River.



***Work on BPA's new high voltage test center at J. D. Ross substation, Vancouver, Wash., is nearing completion. The new test center will make possible substantial savings through a centralized test unit for servicing of present high voltage transmission equipment from 115,000 to 500,000 volts.***

## *Wheeling Program Grows*

Bonneville Power Administration's wheeling program, making the Federal grid available for transmission of non-Federal generation to area load centers, continued its steady growth in fiscal year 1962.

Contractual energy transfers increased by 25 percent over the previous year, totaling 11 billion kilowatt-hours as compared to 8.8 billion. Deliveries from the Rocky Reach plant of the Chelan County Public Utility District, beginning in June 1961, accounted for most of the increase.

## *Long-Term Contracts*

Power is being delivered under long-term firm capacity contracts from the Pelton project of the Portland General Electric Co., the Box Canyon project of the Pend Oreille Public Utility District, the Priest Rapids project of the Grant County Public Utility District, and the Rocky Reach project of the Chelan County Public Utility District.

Excess-capacity contracts cover power from the Swift project of the Pacific Power & Light Co., the Rock Island project of the Chelan County Public Utility District, the Priest Rapids project of the Grant County Public Utility District, and the Idaho Power Co.

## *Coordination Agreement*

Principal non-Federal generating utilities of the region entered into a 1-year coordination contract with BPA during fiscal year 1962 to maximize power output of all Pacific Northwest generating projects. The agreement, a pilot plan for coordination of the region's power resources, will be necessary when the Columbia River Treaty is ratified by Canada.

The 1-year contract will provide the required experience in the complex scheduling of coordinating operation of over 100 projects represented by the participating utilities.

A new 1-year coordination agreement is under negotiation to provide additional experience and knowledge looking forward to a proposed long-term contract.

## *Extra High Voltage*

Bonneville Power Administration initiated comprehensive test and development programs during fiscal 1962 for extra-high-voltage transmission in both alternating- and direct-current fields.

BPA's pioneering and technological advances in extra-high-voltage transmission for moving large blocks of power long distances will eventually save power consumers millions of dollars in lowered transmission costs and interregional coordination of power resources.

Test sections of several different types of 500,000-volt conductors have already been incorporated in an existing 345,000-volt line, preliminary to plans for a proposed 500,000-volt alternating-current line to carry John Day power to coast load centers.

Technical feasibility of direct-current transmission in moving large blocks of power long distances holds the potential for interregional and international power transmission, nullifying the present limitations of alternating-current transmission.

Approval has been received and plans are well advanced for installation of a 5-mile experimental direct-current transmission line from Big Eddy Substation near The Dalles, Oreg., toward John Day Dam. Preliminary investigations show direct-current transmission is feasible and more economical than alternating current for distances of 300 miles and upward where large blocks of power are involved. Alternating current is usually more economical for distances below 300 miles.

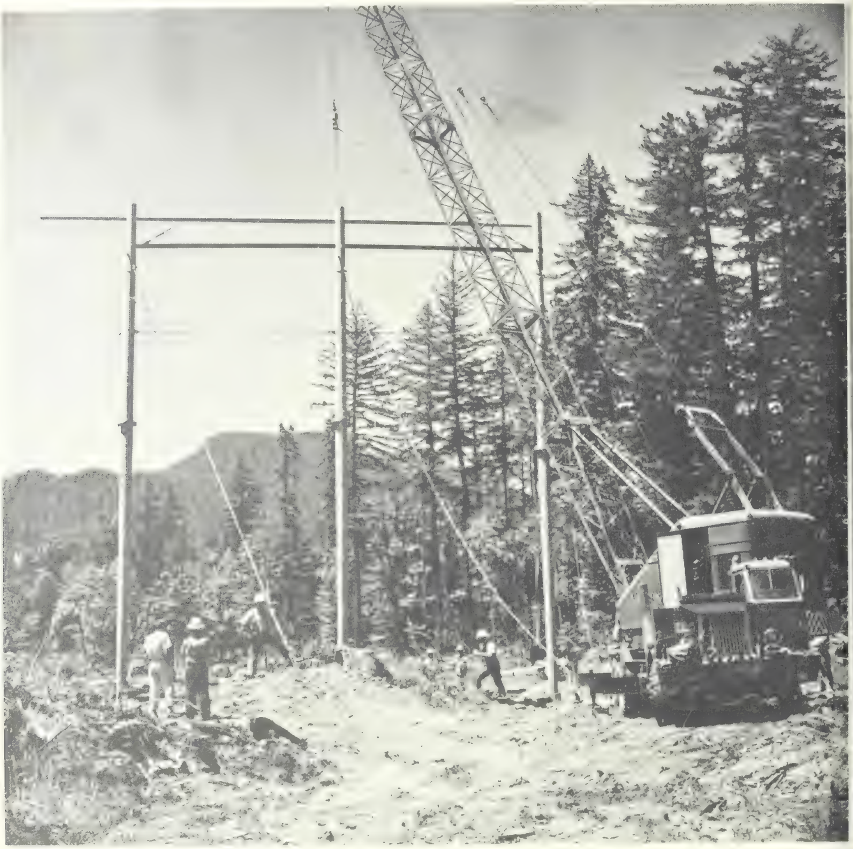
*A new $1 million consolidated supply service center has been completed at J. D. Ross Substation, Vancouver, Wash. The new salvage, rehabilitation, and sales building is expected to save over $100,000 a year by consolidating the services formerly located in several different areas.*

## System Financial Highlights

System gross power revenues during Bonneville Power Administration's first quarter century amounted to $880 million. These revenues were sufficient to cover operation, maintenance, marketing expenses, nterest on the Federal investment in power, and depreciation of power facilities. Net system revenues on a cost basis were approximately $52 million.

## Sales Handicaps

Lack of long-term availability of firm power in the Federal system and installation of considerable non-Federal generation in BPA's marketing area in recent years has resulted in handicapping sales of available power. Starting with fiscal year 1958, private and public utilities curtailed their purchases of secondary power from Bonneville Power Administration as they began producing substantial amounts of power at their own plants.



*A new type of guyed steel H-frame transmission structure, designed by Bonneville Power Administration engineers, is being erected on the Cougar-Willakenzie 115,000-volt transmission line. The new structures have the advantage of a much longer life than wood pole H-frame structures and at the same time are much less costly than the conventional steel tower transmission structures.*

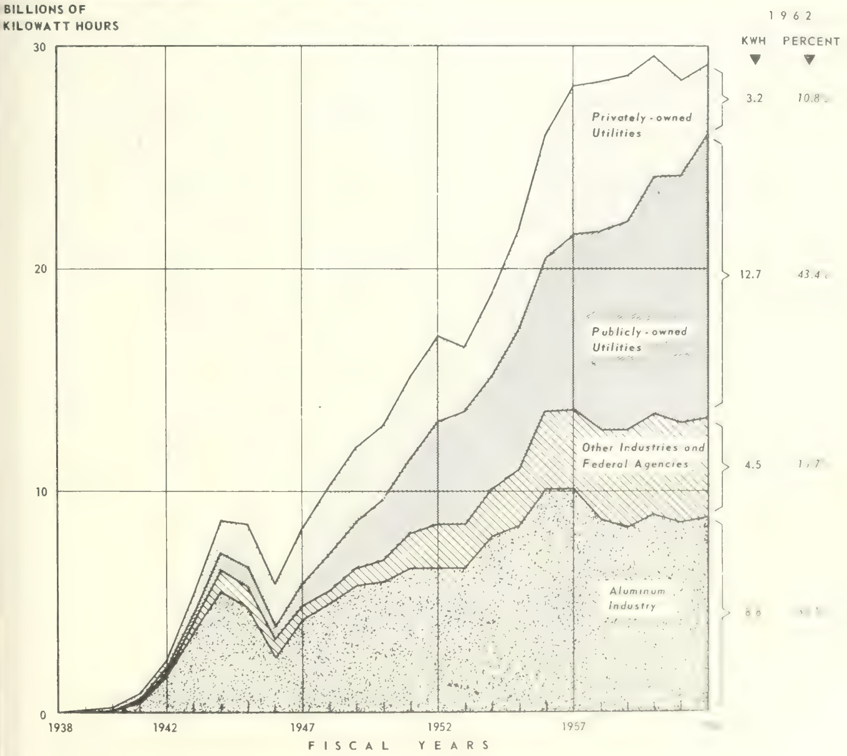
Economic conditions during these years caused the large electrometallurgical industries, particularly aluminum, to curtail their operations and reduce their requirements of interruptible power. BPA has a surplus of secondary power and some short-term amounts of firm power. However, the temporarily available firm power is largely unsalable to Northwest industry because preference customers will require all of it within the next few years and therefore it cannot be offered for sale on long-term contracts.

## *Net Financial Results*

Net financial results have been unsatisfactory during the past 5 years of operations. Revenues have been inadequate while at the same time additions to generating plants and the transmission system have increased costs. Nevertheless, revenues from the Columbia River power system since beginning of operations have been more than sufficient to meet expenses on a cumulative basis. A graphic comparison of salable resources and revenues is shown in the accompanying chart entitled "System Resources and Revenues."

Bonneville Power Administration in each deficit year had more unsold power than the total amount of the deficit. Estimates for the next 4 years indicate some improvement in sales but not sufficient to produce revenue equal to estimated costs.

**Sales of Electric Energy by Class of Customer**



### *Unsold Power*

Unsold power in fiscal year 1962 represented $28,300,000 in potential sales and the forecast for 1963 is $27 million. The chart indicates there will be some decline in the amounts of unsold power during the next few years but even so, unsold power in fiscal year 1966 is estimated at $16 million. However, it is estimated that all firm power will have been sold by that time.

Historically, Bonneville Power Administration has had no difficulty in marketing any available firm power on a long-term contractual basis. Therefore, if some means can be found of firming up the available secondary power or if secondary power can be marketed on an interregional basis, the revenue situation will undoubtedly improve.

### *Revenue Allocation*

Bonneville Power Administration is the marketing agency for the Columbia River power system which consists of the power features of the Federal dams and the BPA transmission system in Oregon, Washington, northern Idaho, western Montana, and a corner of Nevada.

Revenues allocated to the Federal generating projects supplying the power which BPA markets amount to $501,161,000 on a cumulative basis. Allocations to the generating projects are independent of the quantity of energy generated. They are scheduled to repay costs allocated to power plus required irrigation assistance. Actual allocations in recent years have been less than scheduled amounts for repayment for some projects because of unfavorable revenues. However, because of system payout surpluses accumulated in earlier years, the repayment of system investment continues to be somewhat ahead of schedule, approximately $20 million as of June 30, 1962.

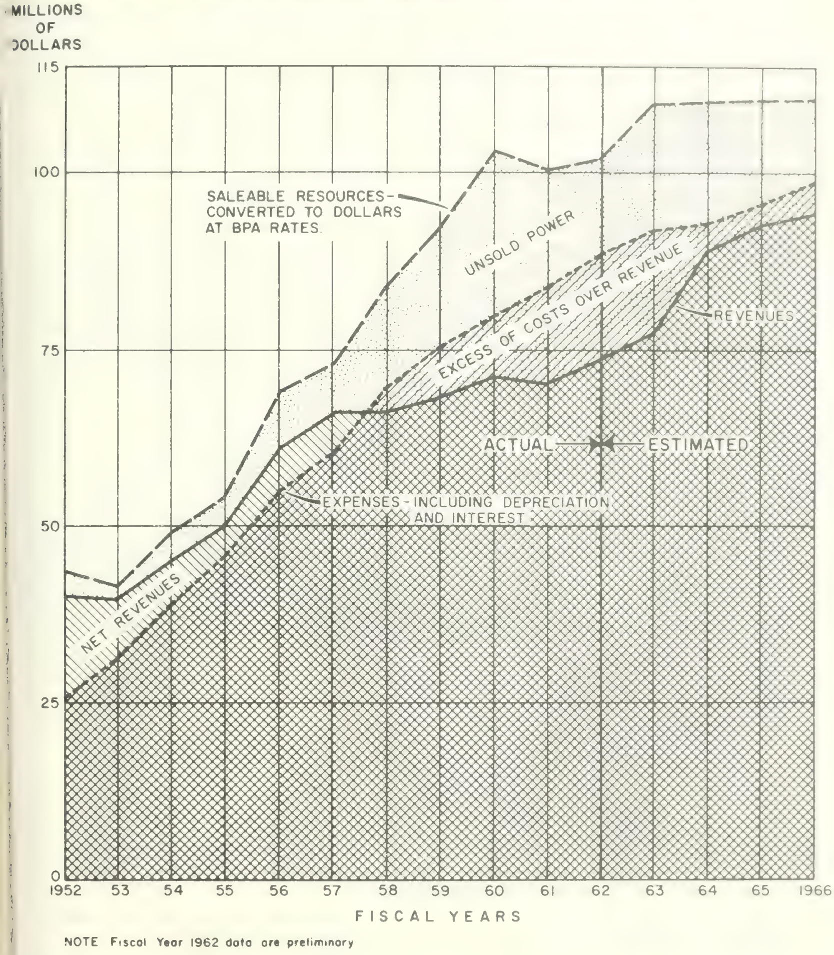
### *BPA Financial Status*

Bonneville Power Administration, separate and distinct from the Columbia River power system, is $15,342,000 ahead of scheduled repayment requirements on a cumulative payout basis. This results because payout requirements have been somewhat lower than depreciation since beginning of operations. The difference is attributable to depreciation being computed on a straight-line basis whereas payout requirements are computed on a compound-interest basis. The latter method produces lower capital repayment requirements during the early period when interest payments are higher.

### *Fiscal Year Revenues*

Gross revenues from electric operations increased almost $5 million during fiscal year 1962. The increase resulted entirely in areas other than firm power sales. Sales of firm power actually were down slightly for the year.

## United States Columbia River Power System
## System Resources and Revenues



NOTE Fiscal Year 1962 data are preliminary

Four factors contributed to the revenue increase:

1. Industries, particularly the aluminum industry, used somewhat rger amounts of interruptible power than in the previous year, alhough still considerably less than their potential. This accounted for $1,232,000 of the increase. The somewhat better market conditions r aluminum were largely responsible for the increase in sales of terruptible power.

*A helicopter is used to carry a steel tower leg across the Columbia River to an island for the Big Eddy-Chenoweth transmission line near The Dalles, Oreg.*

2. Exchange power, between BPA and the utilities of the areas, both privately and publicly owned, increased considerably on a favorable basis and resulted in a revenue increase of $979,000

3. Revenues from wheeling non-Federal power increased substantially during the year as both the privately and publicly owned utilities made greater use of the BPA transmission system to carry their own new generation to markets. Gross revenue increased $1,636,000 from this source.

4. A 1-year coordination agreement between BPA and the privately owned utilities was negotiated whereby BPA received $1,100,000 in additional revenue.

The following recapitulation compares fiscal year 1962 gross revenues by class with the prior year. Both wheeling and coordination revenues, discussed above, are included in the "Miscellaneous" category.

[Thousands of dollars]

| | Fiscal year 1962 | Fiscal year 1961 | Increase or (decrease) |
|---|---|---|---|
| Firm power | 62,027 | 62,235 | (208) |
| Interruptible power | 3,897 | 2,665 | 1,232 |
| Dump power | 175 | 119 | 56 |
| Exchange power | 2,955 | 1,976 | 979 |
| Miscellaneous power revenues | 5,429 | 2,707 | 2,722 |
| Total power revenues | 74,483 | 69,702 | 4,781 |

*As the helicopter holds the tower leg vertically, workers bolt it in place on the anchor strut.*

Financial results of operations on a cost accounting basis for th Bonneville Power Administration for fiscal year 1962 compared wit fiscal year 1961 are shown in summary form by tables V and VI These data are necessarily preliminary because the annual audit b the General Accounting Office was not completed at the time thes statements were prepared.

However, the final figures probably will not be materially differen than those now available.

TABLE V.—*Bonneville Power Administration: Comparative statement of revenues an expenses, fiscal years 1961 and 1962 (preliminary)*

[Cost basis]

[Rounded to thousands of dollars]

| | Total to June 30, 1962 | Fiscal year 1962 | Fiscal year 1961 | Increase or decrease |
|---|---|---|---|---|
| Operating revenues: | | | | |
| Sales of electric energy | $854, 291, 000 | $69, 054, 000 | $66, 995, 000 | $2, 059, 00 |
| Other electric revenues | 24, 444, 000 | 5, 429, 000 | 2, 707, 000 | 2, 722, 00 |
| Total operating revenues | 878, 735, 000 | 74, 483, 000 | 69, 702, 000 | 4, 781, 00 |
| Less revenues allocated to generating projects: | | | | |
| Albeni Falls | 11, 175, 000 | 1, 400, 000 | 1, 200, 000 | 200, 000 |
| Bonneville Dam | 70, 025, 000 | 2, 100, 000 | 2, 100, 000 | ---------- |
| Chief Joseph | 37, 200, 000 | 6, 550, 000 | 6, 500, 000 | 50, 000 |
| Columbia Basin Project | 199, 959, 000 | 12, 800, 000 | 12, 800, 000 | ---------- |
| Detroit-Big Cliff | 15, 940, 000 | 1, 700, 000 | 1, 400. 000 | 300, 000 |
| Hills Creek | 75, 000 | 75, 000 | ---------- | 75, 000 |
| Hungry Horse | 34, 906, 000 | 3, 833, 000 | 3, 833, 000 | ---------- |
| Ice Harbor | 1, 500, 000 | 1, 500, 000 | ---------- | 1, 500, 000 |
| Lookout Point-Dexter | 13, 150, 000 | 1, 750, 000 | 1, 400, 000 | 350, 000 |
| McNary | 80, 935, 000 | 8, 825, 000 | 8, 200, 000 | 625, 000 |
| The Dalles | 34, 320, 000 | 8, 500, 000 | 10, 800, 000 | (2, 300, 000) |
| Yakima-Kennewick | 1, 976, 000 | 345, 000 | 345, 000 | ---------- |
| Total revenue allocated to generating projects | 501, 161, 000 | 49, 378, 000 | 48, 578, 000 | 800, 000 |
| Operating revenues available to Bonneville Power Administration | 377, 574, 000 | 25, 105, 000 | 21, 124, 000 | 3, 981, 000 |
| Less operating expenses: | | | | |
| Purchased power | 11, 212, 000 | 1, 090, 000 | 697, 000 | 393, 000 |
| Operation, maintenance, administration, etc | 146, 591, 000 | 13, 238, 000 | 12, 292, 000 | 946, 000 |
| Total operating expenses | 157, 803, 000 | 14, 328, 000 | 12, 989, 000 | 1, 339, 000 |
| Less interest and other deductions: | | | | |
| Interest on Federal investment | 100, 838, 000 | 9, 759, 000 | 9, 259, 000 | 500, 000 |
| Less amount charged to construction | 8, 629, 000 | 371, 000 | 555. 000 | (184, 000) |
| Miscellaneous income deductions | 1, 266, 000 | (223, 000) | 24, 000 | (247, 000) |
| Total interest and other deductions | 93. 475, 000 | 9, 165, 000 | 8, 728, 000 | 437, 000 |
| Net available for depreciation | 126. 000, 000 | 1, 612. 000 | (593, 000) | 2, 205, 000 |
| Depreciation | 133, 879, 000 | 12, 299, 000 | 11, 670, 000 | 629, 000 |
| Net revenue for period | (7, 583, 000) | (10, 687, 000) | (12, 263, 000) | 1, 576, 000 |
| Cumulative net revenue beginning of year | ---------- | 3, 104, 000 | 15, 367, 000 | (12, 263, 000) |
| Cumulative net revenue end of year | (7, 583, 000) | (7, 583, 000) | 3, 104, 000 | (10, 687, 000) |

## *Revenues and Expenses*

A comparative statement of the revenue and expenses of Bonneville Power Administration on a cost accounting basis is presented in table V. The stateme... shows cumulative data to June 30, 1962, as well as comparative data for fiscal years 1961 and 1962.

TABLE VI.—*Bonneville Power Administration: Condensed statement of assets and liabilities as of June 30, 1961 and 1962 (preliminary)*

[Cost basis]

[Rounded to thousands of dollars]

| | Fiscal year 1962 | Fiscal year 1961 | Increase or decrease |
|---|---|---|---|
| ASSETS | | | |
| lectric plant—original cost: | | | |
| Electric plant in service | $504, 718, 000 | $471, 364, 000 | $33, 354, 000 |
| Electric plant leased to others | 463, 000 | 445, 000 | 18, 000 |
| Electric plant held for future use | 1, 611, 000 | 879, 000 | 732, 000 |
| Construction work in progress | 13, 802, 000 | 31, 997, 000 | (18, 195, 000) |
| Total electric plant | 520, 594, 000 | 504, 685, 000 | 15, 909, 000 |
| Less reserve for depreciation | 117, 518, 000 | 106, 683, 000 | 10, 835, 000 |
| Original cost less reserves | 403, 076, 000 | 398, 002, 000 | 5, 074, 000 |
| urrent assets: | | | |
| Unexpended funds | 17, 261, 000 | 13, 652, 000 | 3, 609, 000 |
| Special funds | 1, 410, 000 | 738, 000 | 672, 000 |
| Accounts receivable: | | | |
| Customers | 10, 512, 000 | 9, 580, 000 | 932, 000 |
| Others | 230, 000 | 356, 000 | (126, 000) |
| Materials and supplies | 4, 201, 000 | 4, 524, 000 | (323, 000) |
| Total current assets | 33, 614, 000 | 28, 850, 000 | 4, 764, 000 |
| ther assets and deferred charges | 438, 000 | 598, 000 | (160, 000) |
| Total assets | 437, 128, 000 | 427, 450, 000 | 9, 678, 000 |
| LIABILITIES | | | |
| vestment of U.S. Government: | | | |
| Congressional appropriations | 669, 297, 000 | 636, 234, 000 | 33, 063, 000 |
| Transfers [1] | 19, 984, 000 | 19, 097, 000 | 887, 000 |
| Interest on federal investment | 100, 837, 000 | 91, 078, 000 | 9, 759, 000 |
| Continuing fund | 1, 833, 000 | 1, 833, 000 | |
| Gross investment | 791, 951, 000 | 748, 242, 000 | 43, 709, 000 |
| Less funds returned | 354, 964, 000 | 332, 133, 000 | 22, 831, 000 |
| Net investment | 436, 987, 000 | 416, 109, 000 | 20, 878, 000 |
| Accumulated net revenues | (7, 583, 000) | 3, 105, 000 | (10, 688, 000) |
| Total investment | 429, 404, 000 | 419, 214, 000 | 10, 190, 000 |
| urrent and accrued liabilities: | | | |
| Accounts payable | 4, 663, 000 | 5, 327, 000 | (664, 000) |
| Employees accrued leave | 2, 506, 000 | 2, 472, 000 | 34, 000 |
| Total | 7, 169, 000 | 7, 799, 000 | (630, 000) |
| eferred credits | 555, 000 | 437, 000 | 118, 000 |
| Total liabilities | 437, 128, 000 | 427, 450, 000 | 9, 678, 000 |

---

[1] Consists of goods and services furnished without charge by other Federal agencies less such items furnished to other agencies by Bonneville Power Administration.

After allocation of revenue receipts to the generating projects, the emaining revenues were $1,612,000 more than the aggregate of PA's expenses of operation, maintenance, marketing, administration, nd interest for the year. This compares with a deficiency of $593,000 r fiscal year 1961. After provision for $12,299,000 depreciation xpense, the net BPA deficit in 1962 was $10,687,000 compared to $12,263,000 in 1961.

Cumulatively through June 30, 1962, revenues available to BPA after allocations to the generating projects, amounted to $377,573,000. These revenues exceed BPA's cumulative operating expense of $157,781,000—plus cumulative interest and miscellaneous expenses of $93,497,000—by $126,296,000. The remaining $126,296,000 was insufficient to provide for total depreciation amounting to $133,879,000 as of June 30, 1962. This leaves a net deficiency of $7,583,000 on the basis of cost accounting since beginning of operations.

## *Comparative Balance Sheet*

Table VI is a statement of assets and liabilities on a cost accounting basis as of June 30, 1961 and 1962. Transmission electric plant in service aggregated slightly more than half a billion dollars at the end of fiscal year 1962, an increase of $33,354,000 during the year. Construction work in progress decreased substantially during the year because of completions of plant under construction a year ago and the fewer new starts during the current year. The total expenditures for electric plant during the year were $15,909,000.

The gross investment of the Federal Government in the Bonneville Power Administration increased $43,638,000 in fiscal year 1962. This increase consists principally of $32,992,000 in new appropriations for operation and maintenance and new construction plus $9,759,000 in interest accrued on the unpaid investment owing the Treasury. Actual funds returned to the Treasury by Bonneville Power Administration, after deducting amounts allocated to the generating projects, totaled $22,831,000 during the year. The unrepaid or net investment of the Federal Government increased only $20,807,000 during the year.

## *Federal Investment Repayment*

The gross amount of the Federal Government's investment in the Bonneville Power Administration together with the gross repayments made to June 30, 1962, and the remaining net investment are shown on table VII on a payout basis. From the beginning of operations through June 30, 1962, the Bonneville Power Administration has covered cash receipts into the Treasury amounting to $856,125,000, of which $501,161,000 has been allocated to the generating projects and $354,964,000 to the transmission system.

Of this $354,964,000 some $134,674,000 went to repay all expenses of operation, maintenance, marketing and administration; $92,209,000 went for interest on the transmission investment; and the balance of $128,081,000 went for repayment of the capital investment. This exceeded scheduled capital repayment requirements of $112,739,000 y $15,342,000 and represented a 23.4-percent repayment of the total pital investment of $547,807,000 at June 30, 1962.

ABLE VII. *Bonneville Power Administration—Summary of Federal investment in transmission system and repayment as of June 30, 1962 (preliminary)*

[Payout basis]

[Rounded to thousands of dollars]

| | Gross investment | Repayments | Net investment |
|---|---|---|---|
| vestment in current expenses: | | | |
| Operation, maintenance, etc | 134, 674, 000 | 134, 674, 000 | |
| Interest | 92, 209, 000 | 92, 209, 000 | |
| Total current expenses | 226, 883, 000 | 226, 883, 000 | |
| vestment in capital assets: | | | |
| Electric plant and other capital assets | 547, 807, 000 | [1] 128, 081, 000 | 419, 726, 000 |
| Unexpended appropriations | 17, 190, 000 | | 17, 190, 000 |
| Total capital investment | [2] 791, 880, 000 | [2] 354, 964, 000 | 436, 916, 000 |

Consists of $112,739,000 scheduled amortization and $15,342,000 repaid in excess of scheduled require-nts. The total repayment $128,081,000 equals 23.4 percent of the invested capital of $547,807,000.

| | |
|---|---|
| Total cash receipts covered into U.S. Treasury by BPA to June 30, 1962 | $856, 125, 000 |
| Less amounts allocated to generating projects | 501, 161, 000 |
| Cash receipts allocated to Bonneville Power Administration | 354, 964, 000 |

## *ntertie Report Completed*

A departmental task force study on the feasibility of a Pacific orthwest-Pacific Southwest intertie was completed in November 61.

Major findings and recommendations were:

— A 750,000-volt direct-current common-carrier transmission line could produce profits of about $6 million annually and two such lines about $15 million a year over the 50-year payout period.

— BPA should not propose to sell power to California customers until Congress has had a chance to act on legislation giving the region first call on all Federal power produced therein.

— BPA should immediately launch a test and development program to make available the economies of high-voltage direct-current transmission for moving large blocks of power over long distances.

— The proposed intertie would be mutually beneficial to both regions through interchange of peaking power, sale of secondary power to displace steam-generated power in California, and firm up 200,000 to 400,000 kilowatts of Pacific Northwest secondary power by moving a small amount of offpeak California steam power to the north.

## *Safeguard Legislation*

The Secretary of the Interior in January 1962 submitted legislatio to Congress designed to give Pacific Northwest customers, bot public and private, first call on all power generated in the region.

The legislation prepared by BPA in consultation with its customers Governors of the affected States, and other interested parties assure that all power needs of Northwest customers will be met before an power is shipped outside the region.

The Secretary strongly urged congressional action on the "regio of origin" legislation to assure permanent legislative and contractua safeguards for electric power and energy now or hereafter generate on the region's rivers and streams.

Administrator Luce urged that no tieline, public or private, b built before Congress can act on the "region of origin" protectiv legislation.

## *Hanford Steam Generation*

The Washington Public Power Supply System, a combine of 1 public utilities, proposed to finance, construct, and operate steam generating facilities at the new Hanford reactor after Congress ha refused to authorize Federal construction of the facilities.

WPPSS would contract with AEC for lease of land, purchase c reactor byproduct steam and other necessary arrangements. Th power output of the reactor, estimated at 800,000 kilowatts, woul be integrated into the BPA grid and marketed by BPA. BPA i turn, would make available to WPPSS an amount of firm power whic at BPA rates is equivalent to the annual financing, operating an maintenance costs of the generating facilities.

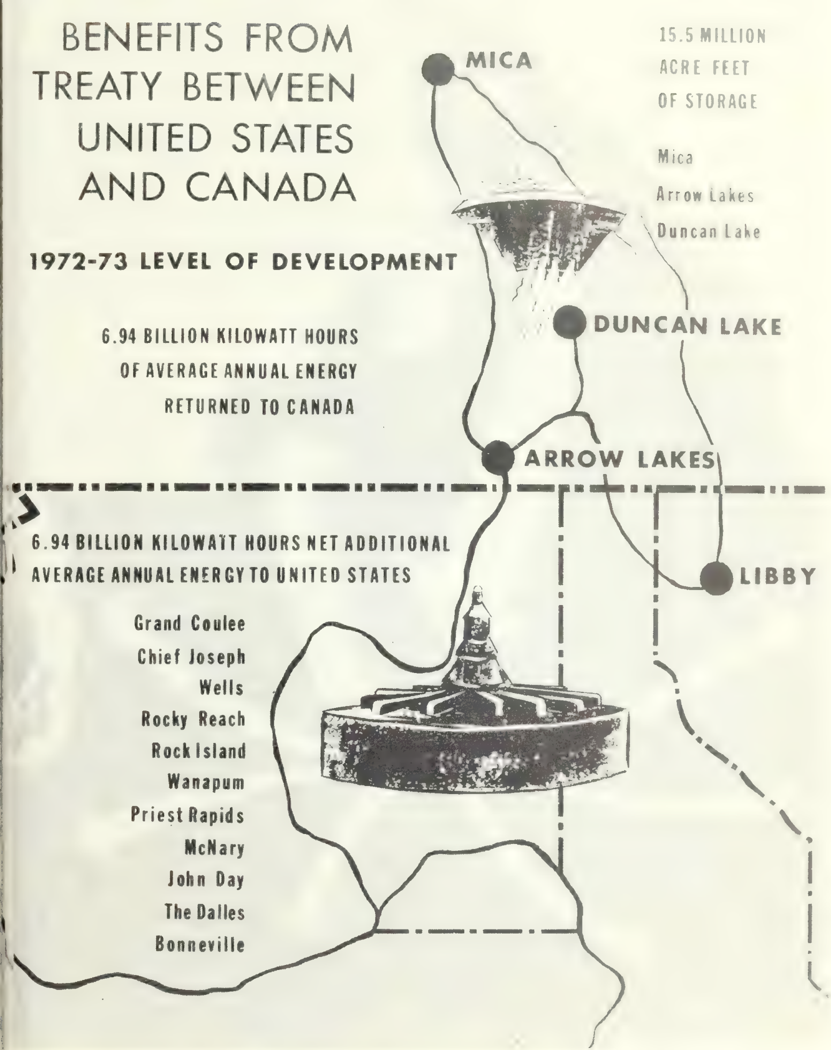
As a result of a General Accounting Office legal opinion that th Atomic Energy Commission does not have authority to enter int the necessary contracts, specific congressional authorization for th project became necessary.

Legislation to authorize the WPPSS proposal was before Congres as the 1962 fiscal year ended.

## *Canadian Treaty*

A continuing liaison and exchange of technical information wa maintained during the year with Canadian governmental representatives on various aspects of the Canadian treaty. Ratification of th treaty by Canada is again expected to come up for consideration whe the Parliament convenes in September of this year.

The increased downstream generation at U.S. plants resulting fro the Canadian storage would be equally divided between the tw


BENEFITS FROM TREATY BETWEEN UNITED STATES AND CANADA
1972-73 LEVEL OF DEVELOPMENT
6.94 BILLION KILOWATT HOURS OF AVERAGE ANNUAL ENERGY RETURNED TO CANADA
MICA
15.5 MILLION ACRE FEET OF STORAGE
Mica
Arrow Lakes
Duncan Lake
DUNCAN LAKE
ARROW LAKES
LIBBY
6.94 BILLION KILOWATT HOURS NET ADDITIONAL AVERAGE ANNUAL ENERGY TO UNITED STATES
Grand Coulee
Chief Joseph
Wells
Rocky Reach
Rock Island
Wanapum
Priest Rapids
McNary
John Day
The Dalles
Bonneville

untries. The proposed construction of three large storage dams Canada and construction of Libby Dam in Montana would add tially about 2 million kilowatts of firm power to BPA resources.

## *uture Power Outlook*

Normal load growth of the Pacific Northwest is now 400,000 kilo-atts of firm average energy per year and will reach 600,000 kilowatts year by 1975. Even if the Hanford reactor project, the Canadian treaty and the California intertie are all realized, new hydro projec will have to be authorized soon and constructed if the region's loa growth by 1975 is to be met.

Even with full and timely development of remaining feasible hyd projects, the region will have to rely increasingly on steam generatic by the mid-1970's. Without the Canadian treaty, the region wou require more steam and require it sooner by at least 2 years tha with the treaty.

The power needs of the region can be met only through the mo intensive efforts of both the Federal and non-Federal public ar private utilities in supplying an adequate energy base for the Pacif Northwest's economic growth.

## *Economic Base Studies*

Bonneville Power Administration in fiscal year 1962 launched a intensive economic study of the Pacific Northwest in terms of pow requirements to 1985. The study will review the economic cap bilities of the region as a basis for powerload forecasts, transmissic system planning, and identifying the economic potentials of specif industries.

All basic outlines and assumptions for the study have been prepare by BPA to assure consistency on a regional basis and technical acc racy. To minimize staff requirements, contracts for specific sectio of the study have been let to the research bureaus of four Sta universities, the U.S. Forest Service and Economic Research Servi of the Department of Agriculture, Bureau of Mines and Geologic Survey of the Department of Interior, General Services Administr tion, and three private concerns.

## *Departmental Requests*

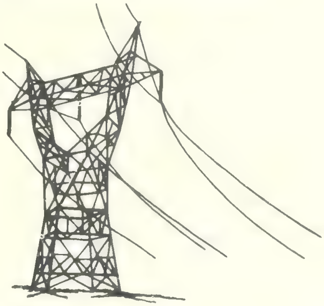
Near the close of the fiscal year, the Secretary of the Interi requested BPA to undertake two special studies, a survey to determi whether all of the State of Idaho should be included in Bonnevi Power Administration's marketing area, and preliminary investigati of the feasibility of a transmission intertie between the Pacific Nort west and the Missouri River basin systems.

A majority of the Idaho congressional delegaton asked the Secreta to initiate the Idaho study. Their request held that economy ar industrial development of southern Idaho was being handicapped not having access to low-cost Columbia River power. The stuc is being made in cooperation with the Bureau of Reclamation and scheduled for completion by October 15, 1962.

The report on feasibility of a Missouri Basin-Pacific Northwe intertie is scheduled for completion in July 1963.

# outhwestern Power Administration

ouglas G. Wright, *Administrator*



For fiscal 1962, Southwestern Power Administration of the Depart-
nt of the Interior received $1,310,000 by direct appropriation for
operation and maintenance program and $950,000 for its con-
uction program. Additional funds in the amount of $294,837
nained available for completion of the previously approved con-
uction program. Authorization by the Congress made $5 million
ailable out of receipts to cover all costs in connection with the
rchase of power and energy and the rental of transmission facilities.

Gross revenues for Southwestern Power Administration for fiscal
ar 1962 were $15,953,392, representing an increase of $1,000,381,
6.7 percent over the gross revenue for fiscal year 1961. During
cal year 1962, sales to private electric utilities accounted for 19
rcent of the revenue dollar; defense industry (aluminum), 12 percent;
ctric cooperatives, 56 percent; municipalities, 10 percent; and
blic authorities, 3 percent.

As of June 30, 1962, the original cost of Southwestern Power
lministration transmission facilities totaled $28,753,576.

## *arketing*

Contractual arrangements in the Missouri area were submitted
ring fiscal 1962 for approval in fiscal 1963 for one of the Nation's
st completely coordinated electric power supply operations, inte-
ating electric energy produced from steam generating plants owned
d operated by six REA electric power cooperatives and three in-
stor-owned power companies with large blocks of hydroelectric

TABLE I.—*Source and application of funds*

| | *June 30, 1961* | *June 30, 1962* |
|---|---|---|
| Funds provided: | | |
| Congressional Appropriations (net) | $42, 498, 722. 85 | $44, 745, 409. 96 |
| Accountability for transfer of cost or property to or from other Government agencies (net) | 742, 036. 95 | 884, 456. 07 |
| Gross operating revenue and other income | 99, 967, 234. 51 | 116, 060, 081. 7 |
| Total funds provided | 143, 207, 994. 31 | 161, 689, 947. 81 |
| Funds applied: | | |
| Returned to U.S. Treasury [1] | 39, 118, 109. 08 | 45, 122, 524. 9 |
| Accumulated operating expenses | 74, 201, 673. 83 | 93, 268, 236. 5 |
| Less nonfund depreciation and amortization expense | (6, 109, 085. 21) | (6, 846, 809. 0 |
| Electric plant | 27, 832, 216. 71 | 28, 753, 575. 6 |
| Special and trust funds | 5, 561, 943. 60 | 5, 280, 800. 4 |
| Cash | 2, 971, 808. 61 | 3, 348, 076. 6 |
| Accounts receivable | 1, 214, 809. 05 | 1, 247, 567. 5 |
| Other current and accrued assets | 20. 00 | 25. 0 |
| Material and supplies | 581, 783. 42 | 661, 375. 3 |
| Prepayments and advances | 2, 139. 65 | 1, 048. 2 |
| Deferred debits | 2, 055. 18 | 2, 372. 2 |
| Less accrued and other nonfund items | | |
| Accounts payable | (613, 865. 43) | (550, 633. 6 |
| Accrued payroll | (23, 399. 86) | (26, 024. 4 |
| Accrued leave | (117, 863. 22) | (133, 581. 2 |
| Contributions in aid of construction | (62, 468. 34) | (65, 032. 2 |
| Accrued interest on invested capital | (1, 351, 882. 76) | (8, 373, 574. 3 |
| Total funds applied | 143, 207, 944. 31 | 161, 689, 947. 8 |

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[1] Total funds returned to the U.S. Treasury. No allocation of revenue has been made to the Corps Engineers to date.

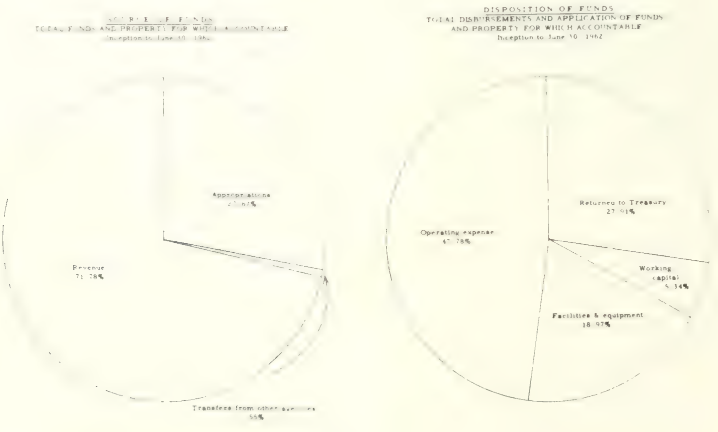


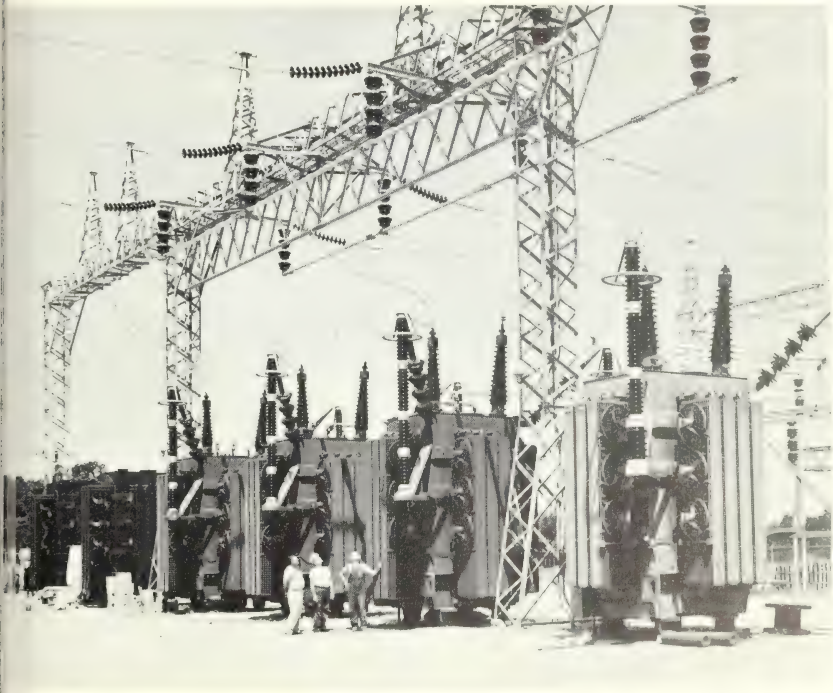
Table No. II

ergy produced from the federally owned Bull Shoals and Table ck Dam projects on the White River in Missouri.

Under this arrangement, SPA will be marketing approximately one- lf million kilowatts of hydroelectric power, realizing for the Govern- nt a gross revenue averaging between $9 and $10 million a year.

A power marketing arrangement was made between SPA, the city of lumbia, Mo., and Central Electric Power Cooperative of Jefferson ty, Mo. Under this arrangement SPA sells excess energy and inter- ptible capacity to the city of Columbia, through the system of ntral Electric Power Cooperative.

Negotiations were continued with Western Farmers Electric Co- erative serving western Oklahoma. Problems have been resolved, sic premises established, and cost and load data developed for egotiation of the SPA-Western Farmers power and transmission reements.



*: 10,000-kilovolt single-phase 161/138 transformers are installed in the eleetka Substation, Weleetka, Okla., serving the South Branch of SPA stomers.*

## *Sales*

SPA's electric power sales in fiscal year 1962 increased to 689,79 kilowatts from 554,520 kiolwatts in fiscal year 1961, an increase o 24.4 percent. The sales were made to 32 publlc bodies, 9 RE electric distribution cooperatives, 9 [1] REA electric generation an transmission cooperatives, 1 defense industry (aluminum), and private electric utilities. The sales of kilowatt-hours of energy b class of customer are set out below:

| | *Fiscal yea 1962* [1] *millions o kw.-hr.* |
|---|---|
| Municipalities | 262. |
| REA electric cooperatives | 1, 359. |
| Public authorities | 69. |
| Defense industry (aluminum) | 549. |
| Private electric utilities | 125. |
| Total | 2, 365. |

[1] Compiled by billing periods.

*Aerial view of the Springfield, Mo., substation and dispatching center. Th Springfield Substation serves as the dispatching hub for all of the Whi River hydropower projects.*

# *Power Production*

## *esources*

Completion of installation of the final two units at Table Rock 50,000 kilowatts each) and two additional 45,000-kilowatt units at ull Shoals during the year increased the installed hydroelectric apacity in Southwestern Power Administration's system to 791,000 ilowatts. The installed and dependable capacity and current capaility of the hydro and steam electric plants in the system are shown n table III.

## *nergy Production*

Inflows into the interconnected system projects were approximately 20 percent of median for the first 8 months of fiscal year 1962 and nly 79 percent of median for the last 4 months, with average flow r the year being approximately 173 percent of median. Storage n the reservoir system was 125 percent of full pool at the beginning f the fiscal year with flood storage in four of the six interconnected rojects, and was approximately 90 percent full on June 30, 1962.

TABLE III.—*Capability data*

| Project or plant | State | River basin | Installed capacity | Dependable capacity | Capability June 30, 1962 |
|---|---|---|---|---|---|
| ydroelectric: | | | | | |
| Interconnected system: | | | | | |
| Bull Shoals [1] | Arkansas | White | 250,000 | 162,000 | 288,000 |
| Denison | Oklahoma-Texas | Red | 70,000 | 54,000 | 80,000 |
| Fort Gibson | Oklahoma | Grand | 45,000 | 45,000 | 48,000 |
| Norfork | Arkansas | White | 70,000 | 56,000 | 80,000 |
| Table Rock | Missouri | do | 200,000 | 138,000 | 230,000 |
| Tenkiller Ferry | Oklahoma | Illinois | 34,000 | 28,000 | 39,000 |
| Subtotal | | | 669,000 | 483,000 | 765,000 |
| Isolated plants: | | | | | |
| Blakely Mountain [2] | Arkansas | Ouachita | 75,000 | 75,000 | 75,000 |
| Narrows | do | Little Missouri | 17,000 | 14,000 | 19,000 |
| Whitney | Texas | Brazos | 30,000 | 24,000 | 28,000 |
| Subtotal | | | 122,000 | 113,000 | 122,000 |
| Total hydroelectric | | | 791,000 | 596,000 | 887,000 |
| eam: | | | | | |
| Central Electric Power Co-op | Missouri | | 15,000 | 16,000 | 16,000 |
| N.W. Electric Power Co-op | do | | 40,000 | 42,000 | 40,000 |
| Western Farmers Electric Co-op | Oklahoma | | 30,000 | 31,000 | 31,000 |
| Total steam | | | 85,000 | 89,000 | 87,000 |
| Grand total | | | 876,000 | 685,000 | 974,000 |

Commercial operation dates:
Unit No. 5 Jan. 16, 1962
Unit No. 6 Feb. 8, 1962
By contract.

TABLE IV.—*SPA total system net hydro generation, fiscal years*

[Millions kilowatt-hours]

| Year | Bull Shoals | Denison | Fort Gibson | Norfolk | Ten-killer | Table Rock | Inter-connected system | Narrows | Blakely[1] Mountain | Whitney | Grand total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total to June 30, 1950 | ---------- | 1,099.1 | ---------- | 1,066.7 | ---------- | ---------- | 2,165.8 | 3.1 | ---------- | ---------- | 2,168.9 |
| 1951 | ---------- | 254.6 | ---------- | 207.6 | ---------- | ---------- | 462.2 | 29.4 | ---------- | ---------- | 491.6 |
| 1952 | ---------- | 142.6 | ---------- | 338.9 | ---------- | ---------- | 481.5 | 42.5 | ---------- | ---------- | 524.0 |
| 1953 | 270.2 | 92.4 | 32.1 | 126.8 | ---------- | ---------- | 521.5 | 47.4 | ---------- | 0.4 | 569.3 |
| 1954 | 334.7 | 192.4 | 39.5 | 132.8 | 43.3 | ---------- | 742.7 | 17.8 | ---------- | 20.2 | 780.7 |
| 1955 | 241.1 | 140.2 | 70.7 | 23.7 | 54.6 | ---------- | 530.3 | 29.2 | ---------- | 30.1 | 589.6 |
| 1956 | 386.6 | 197.0 | 74.8 | 105.5 | 38.4 | ---------- | 802.3 | 21.2 | 66.1 | 48.6 | 938.2 |
| 1957 | 651.5 | 144.5 | 72.6 | 204.3 | 61.9 | ---------- | 1,134.8 | 39.8 | 219.3 | 71.2 | 1,465.1 |
| 1958 | 991.7 | 245.4 | 146.7 | 248.2 | 118.0 | ---------- | 1,750.0 | 45.8 | 177.0 | 83.2 | 2,056.0 |
| 1959 | 488.1 | 109.4 | 161.3 | 208.8 | 106.7 | 10.2 | 1,084.5 | 25.2 | 175.8 | 37.7 | 1,323.2 |
| 1960 | 418.6 | 266.9 | 271.8 | 174.4 | 126.7 | 212.8 | 1,471.2 | 30.4 | 155.6 | 69.4 | 1,726.6 |
| 1961 | 546.1 | 223.8 | 209.7 | 196.5 | 104.3 | 385.1 | 1,665.5 | 39.8 | 198.9 | 83.0 | 1,987.2 |
| 1962 | 743.9 | 213.3 | 308.5 | 164.8 | 138.8 | 431.7 | 2,001.0 | 37.7 | 171.6 | 64.3 | 2,274.6 |
| Total | 5,072.5 | 3,321.6 | 1,387.7 | 3,199.0 | 792.7 | 1,039.8 | 14,813.3 | 409.3 | 1,164.3 | 508.1 | 16,895.0 |

[1] Generation delivered into Arkansas Power & Light Co. system. By contract, 142,000,000 kw.-hr. per year of firm energy is delivered into SPA system.

As a result of the exceptionally high flow during the first 8 months the fiscal year, the total net hydroelectric generation during fiscal ear 1962 was 2,274.6 million kilowatt-hours, the maximum annual neration of record for the system (table IV). The net generation fiscal years for the nine Federal projects currently in operation shown in table IV.

G & T steam electric plants produced 111,157,700 kilowatt-ours for marketing by SPA during fiscal year 1962, with distribution etween plants as follows:

| | *Kilowatt-hours* |
|---|---|
| entral Electric Power Cooperative | 10, 212, 000 |
| orthwest Electric Power Cooperative | 77, 758, 000 |
| estern Farmers Electric Cooperative | 23, 187, 700 |
| Total | 111, 157, 700 |

In addition to the generation from the Federal hydroelectric and &T thermal electric plants, whose output is marketed by SPA, lditional energy was received from other sources in the amount of 4,926,000 kilowatt-hours for delivery to SPA customers during cal year 1962.

## *ajor Program Accomplishment*

In August 1961, representatives of this Administration presented stimony on pumped storage in a hearing before the Irrigation and eclamation Subcommittee of the House Interior and Insular Affairs ommittee.

During 1962 considerable investigation was made of the pumped orage potential available in the SPA area. A cooperative study was ade by the Corps of Engineers, Southwestern Division, and SPA of number of sites in the Arkansas River basin, which included pre-ninary cost and benefit analyses. The report, dated February 26, 62, was forwarded by the Southwestern Division, Corps of Engi-ers, to the office of their Chief of Engineers for review. This report dicated that, while all sites investigated were economically feasible, e apparently better site was on Petit Jean Mountain immediately ove lock and dam No. 9 on the Arkansas River. This site could developed with installed capacity up to 700,000 kilowatts. Another cellent site considered in the study, immediately above Ozark lock d dam and designated as the White Oak site, was only slightly less vorable than the Petit Jean site. The Committee on Public Works the U.S. Senate approved on April 10, 1962, a resolution requesting a review of reports on the Arkansas River and tributaries, publishe in House Document 758, 79th Congress, and other pertinent report "with a view to determining the advisability of modifying the recon mendations contained therein, with particular reference to provid pumped storage hydroelectric power developments in connectio with the Ozark lock and dam and lock and dam No. 9, Arkansa River, Ark., and other possible sites."

### *SPA–MRB Interconnection*

The study of a high-voltage interconnection between the Missou River basin and the Arkansas River basin culminated in the completio of an interim feasibility report of an interconnection between th transmission systems of SPA and Reclamation's eastern division the Missouri River basin. This report was completed in Marc 1962, and subsequently approved by the Department.

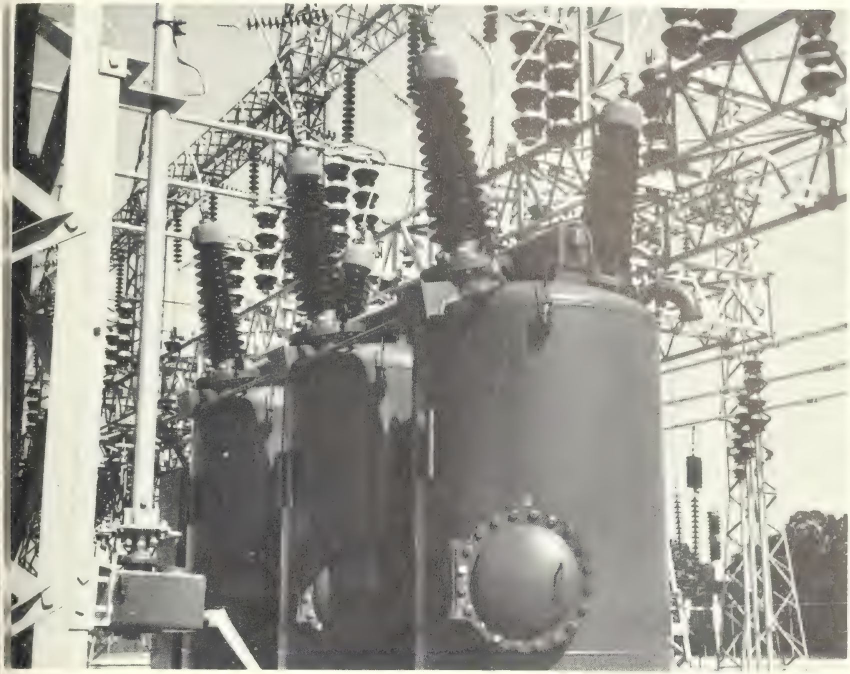
This report determined that it would be economically feasible make a 161-kilovolt interconnection for the interchange of capacit between the two areas. The interconnection would also reduce th obligation for reserve generating capacity in one area by temporar transfer of its obligation to the other areas, permit the exchange emergency power, and meet the traditional trend for more comple integration of major power systems.

### *AC Network Analyzer*

During the past year SPA acquired and installed at the Feder Center in Denver, Colorado, for joint use with the Bureau of Recl mation an AC network calculator. This analog computer w assist in planning studies of the interconnected transmission faciliti of SPA, G&T cooperatives, and the private utilities of the Southwes

### *EHV-Pumped Storage Investigation*

In preliminary discussions of EHV potentialities and the coordin tion of EHV investigations with pumped storage studies it was not that for each 100 miles of 500-kilovolt line, approximately 150,0 kilowatts of hydroelectric generating capacity could be utilized provide reactive and synchronous condenser needs. In April 19 SPA prepared a preliminary report of a combination consisting of potential 500,000-kilowatt pumped storage generating plant with 90-mile EHV transmission line which would be a portion of the pr posed Southwest Power Pool EHV system. The potential pump storage unit was located at the Petit Jean site near lock and dam No on the Arkansas River. The EHV line was considered as in pla between the generating plant and Fort Smith, Ark., and a part



*138-kilovolt oil circuit breakers are installed in the Weleetka Substation, Weleetka, Okla., with the latest safety devices.*

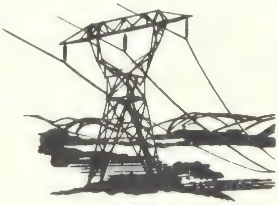
the proposed Southwest Power Pool line between Oklahoma City, Okla., and Memphis, Tenn. The preliminary report was approved by the Department.

## *Interconnected Hydro System Studies*

Additional programs for the IBM 1620 ADP equipment will be prepared in order that a wide range of studies with many varying factors may be made for the present and future interconnected hydroelectric system. In addition to operational studies, programs will also be prepared for the determination of the probability of occurrence of pertinent conditions which affect hydroelectric power operations.

# *Southeastern Power Administration*

Chas. W. Leavy, *Administrator*

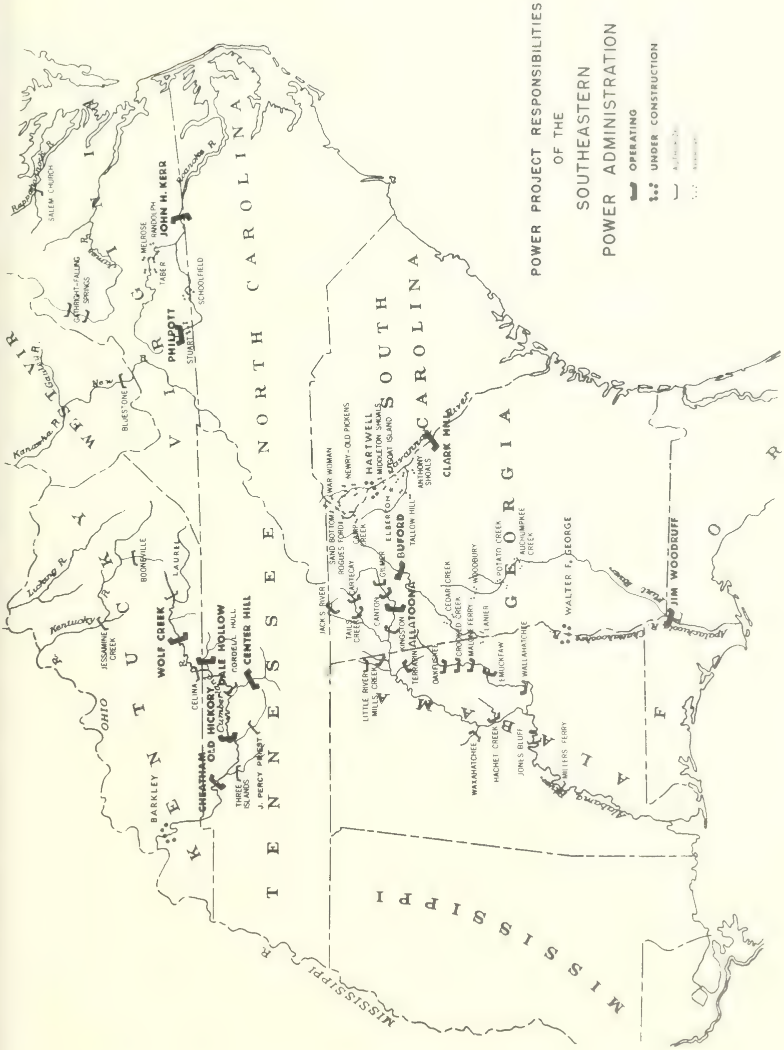


During fiscal 1962, Southeastern Power Administration markete 1,399,400 kilowatts of capacity (with peak generation of 1,626,9 kilowatts) and 4,424,360,914 kilowatt-hours of energy. It was so to 52 public bodies, 74 rural electric cooperatives, 1 Federal agenc and 4 privately owned utilities. Sales during the year earne $23,211,811.86, as compared with $19,711,259.50 for the previo year, bringing the revenues earned in all years to total $154,193,553.7

The output was generated at 12 Corps of Engineers projects. Th were Wolf Creek, Dale Hollow, Center Hill, Old Hickory, an Cheatham projects in Kentucky and Tennessee; the Allatoona an Buford projects in Georgia; the Clark Hill and Hartwell projects Georgia and South Carolina; the Jim Woodruff project in Florid and the John H. Kerr and Philpott projects in Virginia.

The installed generating capacity of 1,349,600 kilowatts includ the first 66,000-kilowatt unit which was placed in commercial oper tion at Hartwell project during the year. Construction by the Cor continued on three projects (Walter F. George in Georgia and Al bama, Hartwell in Georgia and South Carolina, and Barkley Kentucky). The construction underway will add 458,000 kilowat of installed capacity.

The combined output of Wolf Creek, Center Hill, and Dale Hollo projects continued to be sold to the Tennessee Valley Authority und a long-term contract. The entire output of the Old Hickory an Cheatham projects was sold under another long-term contract wi the Authority. Under a contract providing for the integrated oper tion of the Philpott and Kerr projects, the output of Philpott an


POWER PROJECT RESPONSIBILITIES OF THE SOUTHEASTERN POWER ADMINISTRATION
OPERATING
UNDER CONSTRUCTION
WEST VIRGINIA
VIRGINIA
KENTUCKY
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
FLORIDA
Rappahannock R.
SALEM CHURCH
Roanoke R.
JOHN H. KERR
RANDOLPH
MELROSE
TABER
SCHOOLFIELD
GATHRIGHT-FALLING SPRINGS
PHILPOTT
STUART
Gauley R.
New R.
BLUESTONE
Kanawha R.
Licking R.
Kentucky R.
BOONEVILLE
LAUREL
JESSAMINE CREEK
WOLF CREEK
DALE HOLLOW
CORDELL HULL
CENTER HILL
CELINA
OLD HICKORY
Cumberland R.
OHIO R.
BARKLEY
CHEATHAM
THREE ISLANDS
J. PERCY PRIEST
MISSISSIPPI R.
JACKS RIVER
SAND BOTTOM
ROGUES FORD
WAR WOMAN
NEWRY-OLD PICKENS
HARTWELL
MIDDLETON SHOALS
GOAT ISLAND
Savannah River
CLARK HILL
ANTHONY SHOALS
CAMP CREEK
CARTECAY
TAILS CREEK
CANTON
GILMER
ELBERTON
BUFORD
TALLOW HILL
KINGSTON
ALLATOONA
LITTLE RIVER
MILLS CREEK
TERRAPIN
OAKFUSKEE
CEDAR CREEK
CROOKED CREEK
MALONE FERRY
LANIER
WOODBURY
POTATO CREEK
AUCHUMPKEE CREEK
EMUCKFAW
WALLAHATCHEE
WAXAHATCHEE
HACHET CREEK
JONES BLUFF
MILLERS FERRY
Alabama R.
WALTER F. GEORGE
Chattahoochee R.
Flint River
JIM WOODRUFF
Apalachicola R.

two-thirds of the Kerr project output were sold to the Virginia Electric & Power Co. and to 17 cooperatives in Virginia and North Carolina; the remainder of the Kerr output continued to be sold under long-term contracts to Carolina Power & Light Co., and to 16 public bodies and cooperatives in North Carolina.

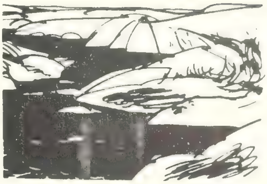
Part of the Clark Hill project output was sold under long-term contracts to two public bodies in South Carolina. The one-half of the output of the Clark Hill project, the output of the first unit at the Hartwell project, and the entire output of the Allatoona and Buford projects were sold under long-term contracts to Georgia Power Co. and 88 public bodies and cooperatives in Georgia.

The output of the Jim Woodruff project was sold under long-term contracts to the Florida Power Corp. and six public bodies and cooperatives in Florida.

The Congress appropriated for the fiscal year $334,000 for headquarters operation and maintenance, and $466,000 for the purchase of firming energy and the payment of wheeling fees. Southeastern's working force numbered 33 employees at the beginning of the fiscal year and 39 employees when the year ended.

# Office of Saline Water

## Charles F. MacGowan, *Director*



Redoubled efforts to develop low-cost saline water conversion processes were made possible by the enactment of the Anderson-Aspinall Act (Public Law 87–295), which President Kennedy approved on September 22, 1961. This new law authorized $75 million for saline water conversion research and development activities during fiscal years 1962 to 1967, inclusive. The previous authorization provided $10 million for an 11-year period.

The initial appropriation for research and development work in fiscal year 1962 was $1,755,000. Following the approval of the Anderson-Aspinall Act, a supplemental appropriation to immediately accelerate the pace of research increased this amount to $5,255,000, and for fiscal year 1963 the Congress has appropriated $7,600,000—a fourfold increase in a single year.

Through its publications and press releases, by participation in technical meetings, and by sponsoring or cosponsoring symposia and conferences, the Office of Saline Water has endeavored to attract the interest of scientists and other technically qualified persons to the problems associated with the development of low-cost conversion processes.

Some of the activities sponsored by the Office of Saline Water or in which members of the staff participated include the Woods Hole Conference, a month-long study jointly sponsored by the Office of Saline Water and the National Academy of Sciences-National Research Council, to outline a long-range fundamental research program; a symposium "Fresh Water From the Sea," sponsored by the European

*Secretary of the Interior Stewart L. Udall (on the right) samples fresh wat*
*converted from the ocean with left to right, former Secretary of the Interi*
*Oscar L. Chapman, Under Secretary James K. Carr, and Senator Clinton*
*Anderson of New Mexico, all of whom participated in the Department*
*the Interior Conference on Saline Water Conversion which was held in t*
*Department Auditorium, Washington, D.C., on March 28, 1962.*

Federation of Chemical Engineering in Athens, Greece; sympos
sponsored by the American Chemical Society, the American Institu
of Chemical Engineers, and the American Society of Mechanic
Engineers; papers on saline water conversion were presented to t
Parliamentarians Conference of the North Atlantic Treaty Organiz
tion, Paris, France; the International Congress on Water Suppl
Berlin, Germany; and the United Nations Conference on New Sourc
of Energy, Wind, Solar, and Geothermal, in Rome, Italy. As
result of the paper delivered in Paris, the NATO Parliamentaria
designated the Office of Saline Water to be the clearinghouse f
saline water conversion information throughout the free world.
1-day Department of the Interior Conference on Saline Water Co
version held in the Department Auditorium on March 28, was attend
by over 500 persons.

The success of this program is reflected in the increasing number meritorious proposals now being submitted to the Office of Saline ter for evaluation.

## Basic Research

The primary objective of the Division of Research is to increase owledge and understanding in scientific fields relevant to the overy of pure water and valuable byproducts from saline waters. rther, it maintains liaison with the scientific community to insure t significant advances in the improvement of water and the obtain- of minerals from saline water are integrated with Department of Interior interests. Past research and development activities of Office of Saline Water have been largely concerned with known cesses and their kinetics.

t has become apparent that further rapid reduction in costs of verted water will require new approaches that are not available present processes. Consequently, emphasis is being placed on

*neral view of a 35,000-gallon-per-day saline water conversion pilot plant ected at St. Petersburg, Fla., to develop a new freeze-conversion process.*

fundamental principles in the expanded research and developmen program authorized by the 87th Congress. Thus, research activitie are concerned primarily with new concepts, ideas, and scientifi knowledge that are generally applicable to any process of saline wate conversion. This involves studies of fundamental concepts in al areas of science and engineering.

## *Inorganic Chemistry*

The Branch of Inorganic Chemistry is supporting a variety of research projects including the removal of calcium and magnesiu (scale-forming elements) and potassium from sea water, solvation o polyvalent anions, behavior and properties of water, polyhedra clathrate hydrates, water research at Oak Ridge National Laboratory and many others. These projects are in two general fields of interest namely, The Composition, Structure, and Properties of Water an Aqueous Systems; and Kinetics, Thermodynamics, and Transport i Systems Containing Water.

For most desalination processes, inefficiencies arise largely from th transport of energy or matter at phase boundaries. High transpor rates operate to cause concentration gradients which oppose th process and introduce additional inefficiencies. Also, large losses ar introduced when significant temperature differences are required t supply needed energy by heat transfer to the system across its boundaries. For these reasons, increasing program emphasis is being place on the process of mass and energy transport at phase boundaries. A accompanying effort is to achieve a comprehensive theoretical understanding of water and its solutions. Further, increasing consideratio will be given to the theory of the liquid state itself, an area wher scientific knowledge seriously lags behind that of either the gaseou or solid states.

## *Physical Chemistry*

The Physical Chemistry Branch in the Division of Research i sponsoring fundamental research on mechanism of water transpor across membranes and on membranes with controllable pore size In addition, basic research on adsorption of ions, ion exchange, an electrochemical processes for water desalination are underwa Additional studies include, among others, coatings on metallic surface energy transfer, mechanism of boiling, and the influence of acoustic vibrations on solid-liquid interfaces.

## *Organic and Biological Chemistry*

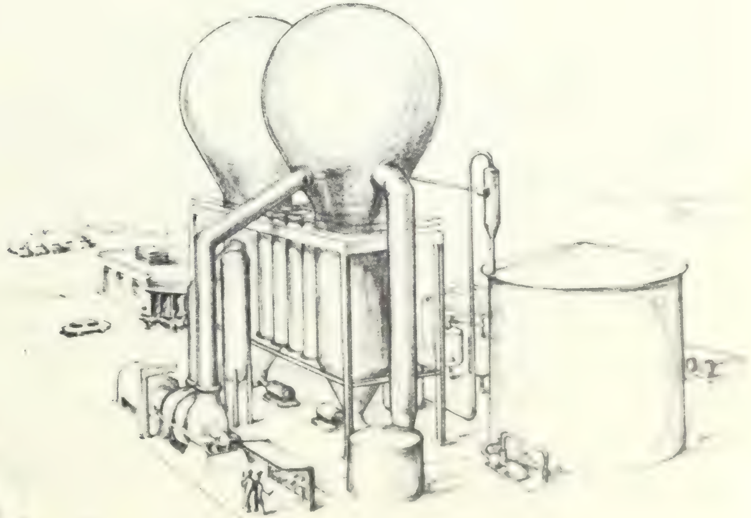
The Branch of Organic and Biological Chemistry, recently established, is currently supporting work on salt transport, salt toleratio nd sensitivity of plants. Future efforts of the Branch will be concerned with the development of a research program in those biological iences where areas of relevancy to the overall problem of water esalination can be developed. Pertinent studies of interest will be itiated in the fields of biological membranes, synthetic membranes, hysiological mechanisms of salt and water transport, ion binding and elease, chelation, enzyme systems, genetics, and fluid dynamics.

## Physics

The work sponsored by the Branch of Physics relates to investigaons of a thermoelectric heat pump, crystallization, energy transfer, ucleation, effects of electrostatic and electromagnetic fields on conentration of ions at interfaces and as a means of separation.

## Materials

Currently the Branch of Materials is supporting investigations ealing with the mechanism of scale formation and means of alleviating he problem, basic studies on corrosion of selected pertinent materials,



*Artist's conception of the 1-million-gallon-per-day saline water conversion demonstration plant at Roswell, N. Mex., now under construction.*

heat transfer rates, thermodynamic properties of sea water, and coa ings.

### *Economics*

The Branch of Economics has formulated two quite specific pr grams: one with short-range and the other with long-range objective Under the former, two projects are actively being pursued; namel the updating and refining of the Office of Saline Water's "Standardiz Procedure for Estimating Costs of Saline Water Conversion"; ar consideration of development of a sister procedure for estimating cos of providing existing and incremental water supplies from convention sources. The objectives and problems involved in the long-ran program currently are being discussed with a great number of ur versities, research organizations, consultants, and industrial group

## *Processes Development*

Applied research is being conducted to solve a number of problen in order to more fully develop existing conversion processes as well to carry out further development of the new conversion techniqu resulting from the basic research program. Under the process development program, pilot plant and other studies were conduct on the distillation, electrodialysis, and freezing processes prior to the selection for the five demonstration plants. Efforts to reduce the co of the conversion methods have been pursued through two fund mental approaches; namely, the reduction of capital equipment ar associated costs, on the one hand, and reduction of energy requir ments, on the other. Optimization of these and other operation factors have been important in the overall cost of conversion. Proce development has been conducted with emphasis on the major proce groups of distillation, membranes, freezing, and a general category other chemical, electrical, or physical conversion methods. Tl research and development is being conducted by means of pilot-plar operations, testing of prototype units, and a variety of applied researc related to the various processes.

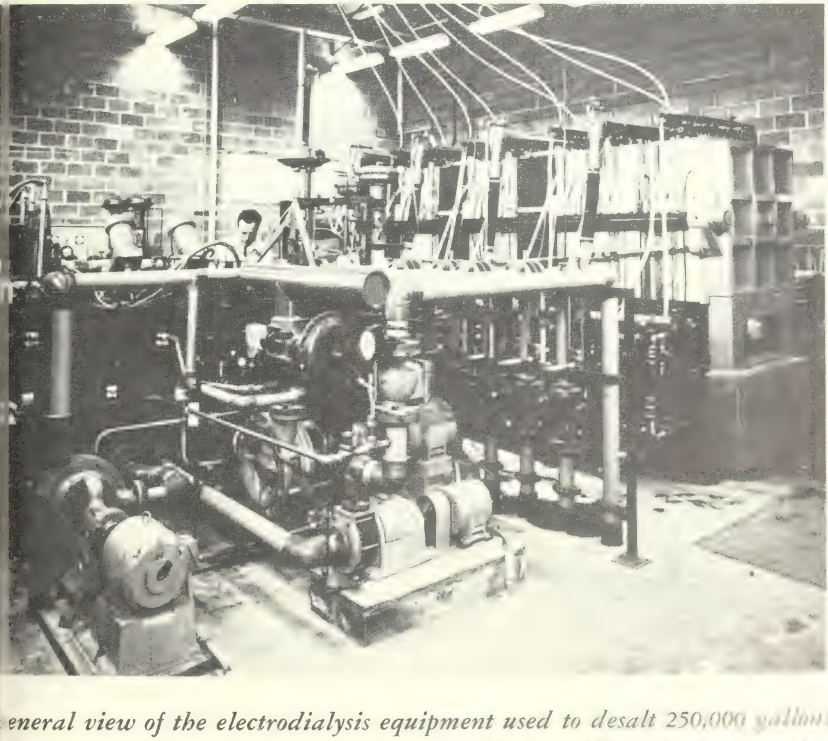
### *Pilot Plants Test Station*

Facilities for future pilot-plant operations are being greatly e hanced through the construction of a Research and Developme Pilot Plants Test Station at Wrightsville Beach, N.C. Bids we opened on April 24, 1962, and a contract was awarded to the Pott Brown Co. of Charlotte, N.C., for the construction of the facility at cost of $825,000.

The land for the facility was donated to the Department of the terior by the State of North Carolina. Completion of the facility is heduled for December 1962. The facility will allow operation of rious types of pilot plants under standard conditions.

## ale Control

Distillation processes provide the principal commercial method for taining fresh water from sea water, and it is estimated that land-sed installations provide 20 million gallons of fresh water daily from water. Although distillation processes have been under develop-nt for longer than other methods, their full potential is yet to be lized. Characteristic of the distillation field is the wide variety of signs and cycles employed. Scale formation has long been a oblem with distillation units as well as most other methods. Al- ough various procedures have in the past been employed to prevent le, and others are now under development, the effects on the process iciency and design are of such importance as to make necessary the



*eneral view of the electrodialysis equipment used to desalt 250,000 gallons fresh water per day at the Webster, S. Dak., saline water conversion monstration plant. This plant was completed and placed in operation October 20, 1961.*

continued development of improved scale-prevention methods Effective and economical means of scale control will not only overcome reduced heat transfer resulting from scale but will also permit greater economy and efficiency through higher temperature operation and higher brine concentrations.

Control of both calcium sulfate and alkaline scales through internal stabilization or sludge recirculation has been conducted with a forced circulation evaporator, an experimental multiple-stage flash evaporator, and the modified pilot-plant equipment used originally for the LTV process. In addition to sludge recirculation, the use of additives (Hagevap and related substances) for scale prevention is also under study. Another approach to scale prevention is the use of an ion exchange softening procedure in which the waste brine concentrate serves to regenerate the ion exchange resin. The development of these procedures has progressed to the point where both ion exchange softening and sludge recirculation are being incorporated as alternate methods for scale prevention in the Roswell, N. Mex., demonstration plant.

## *Heat Transfer*

Much of the new research is being directed toward methods which will materially increase the heat transfer in the evaporators. The use of thin films to transfer the heat and provide an evaporating surface is being investigated in detail. In the thin film developments, a 37,000-gallon-per-day (gpd) pilot plant is now under construction to evaluate the wiped film evaporator concept. A detailed evaluation is also being made of the use of a thin film on a fluted surface either in tube or sheet form.

The vapor reheat process in which there are no metallic heat transfer barriers has reached the pilot-plant stage and a unit of 4,600 gpd is currently under construction.

A thermodynamic and economic evaluation is in progress on the merits of the use of a secondary heat transfer media. The effects of geometry on the design of multiple-stage flash distillation units are under study.

## *Solar Distillation*

The operation of experimental types of solar stills at the Daytona site has resulted in the design and installation of an improved type of basin solar still which uses only concrete, glass, and asphalt in its construction. Simplicity of design in this 3,000-square-foot still gave a major reduction in the cost per square foot. The materials used are expected to give very long life with minimum maintenance. Test operations during the past year have been very satisfactory.

Solar distillation, which is basically a humidification process, has led to other studies of humidification as a conversion method operating either with a solar heat source or a conventional fuel source. For these humidification designs, heat recovery systems are employed analogous to heat recovery in multiple-effect flash distillation.

### *Membrane Processes*

Research and development is continuing on membrane processes with particular emphasis on electrodialysis which is further advanced than the other membrane processes and is especially important in the conversion of brackish waters. A major part of the effort in electrodialysis has been the development program being supported by the Office of Saline Water at the Bureau of Reclamation Laboratories in Denver, Colo. A general program of electrodialysis process studies has been continued in which evaluation of commercial cells and membranes have played an important part. Five different commercial units and as many membranes have been evaluated.

*More than 4,000 people gathered on March 10, 1962, for the dedication ceremony of the 1-million-gallon-per-day saline water conversion demonstration plant on Point Loma, near San Diego, Calif.*

A brackish water well near Denver has been utilized to supplement laboratory tests. The preparation of a manual for the laboratory characterization of membranes is nearing completion. The processes development studies at Denver have also provided assistance to the electrodialysis demonstration plant at Webster, S. Dak.

## *Freezing*

Two different freezing processes are being investigated by the Office of Saline Water at pilot-plant level. The first utilizes the principle of flash evaporation of precooled sea water with the subsequent absorption of the water vapor by a chemical absorbent. The resulting ice is separated from the saline liquor and washed free of adhering salt and then melted by utilizing the heat of absorption. A 15,000-gpd pilot plant has been operated throughout the year at Wrightsville Beach, N.C. Operation of the unit has been very satisfactory and the technical feasibility has been fully demonstrated.

The other freezing method is based on a system in which the precooled sea water is frozen by flashing a hydrocarbon refrigerant (butane) in direct contact with the feed stream. The ice crystals are washed free of salt and melted by condensation of the refrigerant vapor. A 35,000-gpd pilot plant has been in operation at St. Petersburg, Fla. The technical feasibility of the method has been established and both systems have been included in the specifications for the fifth demonstration plant which is to be a freezing plant of 250,000-gpd capacity to be located at Wrightsville Beach, N.C.

A modification of the process using a refrigerant in direct contact with the saline feed water is also under study. This involves special procedures to induce large crystal growth to enable washing and separation by either vacuum filtration or centrifugation. A 15,000-gpd pilot plant is now being designed and constructed.

## *Hydrate Process*

The hydrate process is one of the newer processes approaching the pilot-plant stage. Research on the process has reached the point where further verification on a pilot-plant scale is warranted. At present a 10,000-gpd pilot unit is being designed, with construction of the plant to follow. Although various materials form hydrates, hydrocarbons have suitable properties for this purpose and propane has been utilized in the research. In operation the propane combines with the water to form an insoluble hydrate. The hydrate is washed free of the salt water, decomposed by melting, and the product water and propane separated. The propane functions both as a constituent of the hydrate and as a direct refrigerant. Hence, the hydrate crystals are melted and decomposed by the condensing propane in a cycle analogous to the freezing system using a direct contact refrigerant.

### *Solvent Extraction*

The application of liquid-liquid extraction as a means of desalting saline waters has been shown not only to be theoretically possible but in practice to offer advantages in the conversion of certain types of brackish waters in the range from 5,000 to 10,000 ppm. Liquid-liquid extraction is based on the principle that fresh water may be extracted from salt solutions by a solvent as a mixture of solvents that is capable of dissolving salt-free water without losing the identity of the solvent as a separate phase and thus releasing the fresh water by a moderate increase in temperature. Consideration is being given to construction of a pilot plant of 2,000-gpd capacity during the coming year.

## *Demonstration Plants*

The five demonstration plants authorized under Public Law 85-883 are programed as follows:

| | |
|---|---|
| Long tube vertical multiple-effect distillation | Freeport, Tex. |
| Multistage flash distillation | San Diego, Calif. |
| Electrodialysis | Webster, S. Dak. |
| Forced circulation | Roswell, N. Mex. |
| Freeze demineralization | Wrightsville Beach, N.C. |

After being placed in operation during the spring of 1961, the 1-million-gallon-per-day saline water conversion demonstration plant at Freeport, Tex., was subjected to the full fury of the driving winds and floodtides of Hurricane Carla. Over 6 feet of sea water engulfed the plant, ruining all instruments and electrical gear as well as inflicting other damage. However, in spite of the extensive damage, the plant was back in operation 4 days after the waters subsided, providing a needed source of water, free of silt and contamination, for the city and industry of Freeport. The plant has been in almost constant operation since that time. Initial estimates of the cost of the fresh water produced by the plant are in the range of $1–$1.25 per thousand gallons.

The 250,000-gallon-per-day demonstration plant designed to desalt the brackish well water of Webster, S. Dak., was completed and placed in operation on October 20, 1961. The plant utilizes a membrane process to reduce the salinity of the Webster well water from approximately 1,800 dissolved parts of salt per million parts of water (ppm) to less than 275 ppm.

*Aerial view of the 1-million-gallon-per-day saline water conversion plant on Point Loma, near San Diego, Calif. This plant was completed and placed in operation on March 10, 1962.*

A third demonstration plant, located on Point Loma near San Diego, Calif., was officially accepted by the Government on March 10, at a ceremony attended by over 4,000 people. This plant uses a multistage flash distillation process to produce 1 million gallons of fresh water per day. Shortly after the plant began producing fresh water, a major operating problem was encountered. The difficulty

id not involve the operation of the conversion process, but rather the
ea water intake system. An inordinate amount of seaweed ham-
ered the efficient operation of the intake system. A number of
nprovements to the intake screens corrected the situation and the
lant is operating at or above designed capacity.

Specifications were issued and bids accepted for the demonstration
lant to be constructed at Roswell, N. Mex. A $1,794,000 construc-
t on contract was awarded to the Chicago Bridge & Iron Co. The
lant is scheduled to be completed and in operation in July 1963.
pecifications were also completed and issued for the Wrightsville
each, N.C., demonstration plant.

The Demonstration Plants Division staff assisted the Columbian
overnment in selecting an architect-engineer for the purpose of
eveloping specifications for a proposed combination power and sea
ater conversion plant for the island of San Andres in the Caribbean.

# *Office of the Assistant Secretary Fish and Wildlife Service*

**Frank P. Briggs,** *Assistant Secretary*

Acting for the Secretary of the Interior on Fish and Wildlife matters and directing policies of the Bureau of Commercial Fisheries and the Bureau of Sport Fisheries and Wildlife, the Assistant Secretary for Fish and Wildlife is deeply concerned with international as well as national conservation problems.

The Department of the Interior's Fish and Wildlife Service, two bureaus—Sport Fisheries and Wildlife and Commercial Fisheries—each with a director and executive staffs, are responsible for migratory birds with all their problems, and commercial fisheries with similar ields of concern force the Assistant Secretary into international fields. At the national level, his Office is responsible for direction of research, aboratories, wildlife refuges, and fish hatcheries.

The Commissioner for Fish and Wildlife Service supervises the day-to-day operation and direction of the Fish and Wildlife Service programs and works closely with the Assistant Secretary in setting up plans, goals, and policies.

Our renewable national wealth is capable of being maintained and greatly improved by proper management, but equally possible of destruction if unwisely exploited. Properly managed, our resources can provide food and employment, directly and indirectly. The training and recreation afforded by these resources strengthen national defense by contributing to the general health and physical fitness of millions of citizens and the existence of seaworthy ships with trained crews is a direct national asset.

The trend toward greater interest in the sea and a greater utilization of its products has accelerated, with many nations increasing the size and efficiency of their fishing fleets and with new national flags appearing on the fishing areas of the high seas. A new interest in the sea has been exhibited by many countries, and the concerted research activities of many American agencies stress the importance of oceanography in meeting and solving resource conservation problems.

The trend also is for more utilization of outdoor areas by those who want to hunt and fish and those who want to hike and look while the developing Nation absorbs more and more of the outdoor areas which were once available for recreation and wildlife habitat.

In brief, the activities of the Fish and Wildlife Service consist of meeting international fish and waterfowl problems through international commissions, treaties, and conservation; in extensive research on both sport and food fish in laboratories, lakes, streams, and on the high seas; by management of the migratory game bird resources and by the operation of a huge national wildlife refuge and national fish hatchery system; by the management of the great fur-seal resources; by research on various wildlife problems, including studies on genetics, disease, the effects of pesticides on fish and wildlife, methods to control pest and predators without damage to trees, bird-banding studies, breeding and wintering ground studies, techniques for measuring waterfowl production, and numerous other activities; exploratory fishing and gear improvement programs to help the American fisherman in his competitive relationship with the fishermen of other nations; intensive study to get the most and best nutritive value from sea products; and so on through an almost endless roster of activities.

# Fish and Wildlife Service

## Clarence F. Pautzke, *Commissioner*

A major problem facing the Nation is adjusting its fish and wildlife esources to the changing combinations of land and water and in eeting the challenge of developing the food potential of the lakes nd oceans.

The vast Fish and Wildlife Service program designed to consolidate r fish and wildlife resources with the changing face of the country nd to help the seas supply their quota of food for the increasing opulation is conducted under the general supervision of the Com- issioner of Fish and Wildlife, who is, in turn, responsible to the ssistant Secretary of the Interior for Fish and Wildlife.

Under the Commissioner are two operating arms—the Bureau of ommercial Fisheries and the Bureau of Sport Fisheries and Wildlife. ach Bureau operates in a distinct field, although in some instances eir programs and operations are on parallel or similar courses. n those instances, the task of coordination is added to the directional sponsibilities of the Commissioner.

The conservation program conducted by the Fish and Wildlife rvice of the Department of the Interior is both national and inter- tional in character. The Service is linked or allied with numerous terstate programs and is directly concerned with 12 international nventions or commissions.

The Commissioner has two areas of responsibility in relation to ternational conservation. In some instances, he is a member of n international commission by Presidential appointment; in others s responsibility stems from the relationship of the international mmission to the activities of one of the component bureaus.

The Commissioner and personnel of the two bureaus are members of, or participate actively in, international commissions and operate under international conventions dealing with fur seals, Pacific halibut, Pacific salmon, whales, Indo-Pacific fishery research, Northwest Atlantic fisheries, tropical tuna, North Pacific fisheries, Great Lakes fisheries, shrimp, and two migratory bird treaties.

A member of the Commissioner's staff served on the U.S. delegation as a representative of the fish and wildlife conservation interests, to the International Conference on Prevention of Pollution of the Sea by Oil in London, England, in March and April 1962, attended by representatives of 56 nations and 8 international organizations. This Conference was convened to consider amendments to improve and strengthen the 1954 convention which the United States ratified in 1961. The Commissioner's staff member also served on the national committee dealing with this problem prior to the Conference, and assisted with the first national survey of the effects of oil pollution on our fish and wildlife resources.

Owing to the great expansion of fishing activities on the high seas during the past year, there is a growing need for effective international cooperation. The Office of International Relations, through which many matters of policy and routine flow in connection with the international commissions, is under the direct supervision of the Commissioner. This Office also supervised the Service's continued cooperation with the Agency for International Development in providing technical assistance to friendly foreign countries in the development of their resources. A notable feature of the past year has been the great interest in training African technicians in the development and conservation of the magnificent wildlife resources of that continent. Also, there is a growing recognition of the need for greater use of the large marine and inland fishery resources of Africa.

The Commissioner's contact with Bureau operations on both the national and international level is through the directors of each of the two bureaus and through the Office of Program Review which performs staff functions for the Commissioner. One of these is the sponsoring and coordinating of an active safety program in the component bureaus of the Fish and Wildlife Service to reduce work injuries, property damage, motor vehicle accidents, fires, tort claims, and accidents to the public who use Service-administered facilities. Field activities of both bureaus aggressively participated. Direct costs of work injuries, resulting time lost from the job, and the cost of property damaged through accidents showed substantial reductions.

Secretary of the Interior Stewart L. Udall personally presented the Department's Annual Fleet Safety Award to the Bureau of Sport Fisheries and Wildlife for the best motor vehicle accident record in the Department—an outstanding 1.9 reportable accidents per 1 million miles of driving. The increasing use of Service facilities for public recreation presents a growing public safety problem.

The Commissioner also has general responsibility for acquainting the public with progress being made in carrying out his responsibilities of consolidating fish and wildlife resources with changing conditions. Much of this task is done by another staff unit, the Office of Information, which in the last half of the year launched an expanded program of public education concerning the work and significant contributions of the Fish and Wildlife Service.

The first of a series of large posters, designed as educational aids for general use by personnel of both bureaus and for schools, field installations of each bureau, and other interested groups, was completed and was received enthusiastically. This first poster illustrates the work of the Fish and Wildlife Service—"Research and Management for Food and Recreation." The series as planned will eventually consist of 20 posters showing different phases of the work of each bureau and their relation to the overall program of fish and wildlife conservation.

A new *Something About* series was initiated for correspondence aids in answering the thousands of inquiries received from the young citizens of today who will be the conservation leaders of tomorrow. These new aids deal with subjects that have been found to be of particular interest to these young people and are written in nontechnical, easily understood language for their benefit. A collection of *Conservation Thoughts* also have been published in the form of small illustrated placards, suitable for framing or for school bulletin boards.

Attractive folders were designed and produced for use in distributing Bureau of Sport Fisheries and Wildlife conservation literature in kits at public meetings, teachers' conferences, and similar functions. Exhibits were also provided at many such meetings throughout the country during the year.

The Office of Information cooperated with the national organization of 4–H Clubs of America in producing a 4–H Club leader's handbook on conservation which is to be made available during the coming year.

The Office of Information's staff wildlife artist made a major contribution to the Department of the Interior exhibit at the President's White House Conference on Conservation. His oil painting picturing the recreational values of the great outdoors was the "centerpiece" of the exhibit.

Special duck hunting conservation education efforts during th hunting season included a television short, special poster, and newspaper cartoon to carry the theme of "Shoot Only Drakes—Spare th Hens To Nest Next Year" to the duck hunters. To help hunters an others learn how to identify ducks to protect the birds in short supply a 14-minute film in sound and color, "Know Your Ducks," was completed and put into circulation.

# *Bureau of Sport Fisheries and Wildlife*

## Daniel H. Janzen, *Director*

The continued decline of the continental waterfowl population and he accelerating encroachment of civilization upon fish and wildlife abitat emphasize the importance of the national wildlife refuge ystem and the national wildlife management and research programs onducted by the Fish and Wildlife Service's Bureau of Sport Fisheries nd Wildlife.

Additional impetus to the Department of the Interior's sports isheries and wildlife program was given by the passage of important onservation legislation and by the endorsement of the Bureau's land cquisition program by the Outdoor Recreation Resources Review ommission in its report to the President and the Congress.

The most significant of these wildlife conservation laws enacted uring the year was the Wetlands Loan Act authorizing an advance f $105 million over a 7-year period to accelerate the Bureau's land cquisition program. This will permit the Bureau to make consider-ble progress in perpetuating the waterfowl resource.

A reservoir research program which the Bureau inaugurated during he year is designed to get the information necessary to keep America's arge manmade lakes up to their maximum fishing potential. Only portion of this potential is being utilized now. These artificial lakes over more area than all the natural inland lakes and ponds in the ountry and provide one-fourth of the Nation's fishing. As popula-ion increases and as the potential of these lakes develops, a much igher percentage of the fishermen will seek recreation on these inland aters. Reservoir research centers were established during the year n Arkansas and South Dakota to study the fishery problems of im-ounded waters.

Attention is called also to another phase of conservation—the enforcement of conservation laws. During the 10-year period ending in 1962, 365 individuals have been arrested for that wanton destruction of waterfowl known as market hunting, and thousands of others have been apprehended for less disastrous violations. But the wholesale arrests by Bureau personnel clearly show that although market hunting was outlawed 62 years ago it continues to exist and must be constantly curbed.

## *Managing Wildlife and Sport Fishery Resources*

As other nesting, resting, and feeding areas are lost through drainage, drought, and urbanization, ever greater attention must be directed toward the fullest possible use of the national wildlife refuges by wildlife. Techniques to increase the wildlife use of the refuges continue to be developed. Controlled water manipulation and reduction of predator species have resulted in marked waterfowl production on refuge areas, notably the Monte Vista refuge, Colorado, and the Agassiz refuge, Minnesota.

*The Canada goose nests on more than 60 national refuges.*

For more than 25 years, this Bureau has been striving to reestablish the Canada goose as a migrant the full length of the Mississippi Flyway. For many years wintering concentrations were found no arther south than Horseshoe Lake in southern Illinois. Now, concentrations of Canada geese have been brought southward along the east side of the Mississippi River to the Yazoo refuge, Mississippi, within 250 miles of the gulf coast. On the west side of the river, hese geese are reestablished as migrants to the White River refuge n east-central Arkansas, about 325 miles from the gulf coast. Under he new wetlands acquisition program, it should be possible to fill n the remaining gaps of the flyway in Arkansas, Louisiana, and Mississippi, as well as to add some crop and grazing lands to the mportant Lacassine and Sabine refuges, where major wintering concentrations of Canada geese occurred in earlier years.

Federal refuges provided a billion and a quarter use-days by waterfowl during the past fiscal year.

## *Accelerated Land Acquisition Program*

Since fiscal year 1961 all proceeds from the sale of duck stamps (except expenses incurred by the Post Office Department in connection with sales) have been earmarked for the location and acquisition of lands for waterfowl use. During fiscal year 1962, funds were obligated for the acquisition of 18,590 acres of land for refuge purposes. These lands, in 16 separate units, are located in 14 States. In addition, funds were obligated for 16,650 acres of small wetlands for waterfowl production purposes in the States of North and South Dakota and Minnesota. Of this total, 11,682 acres were acquired n fee and 4,968 acres by easements to preserve the existing waterfowl nesting habitat.

The Congress has recognized the inadequacy of duck stamp funds to acquire, while still available, the wetlands and other waterfowl habitat needed to preserve the waterfowl resource. The Wetlands Loan Act of October 4, 1961, authorized the appropriation of not to exceed $105 million for the 7-year period beginning with fiscal year 1962. These moneys are a loan to be repaid to the U.S. Treasury from duck stamp receipts at the rate of 75 percent of the annual duck stamp receipts beginning with fiscal year 1969. The Congress appropriated no moneys under this authorization for fiscal year 1962, but has appropriated $7 million for fiscal year 1963.

## *Wetlands Program Defined*

With congressional authorization for the appropriation of $105 million for a 7-year period, the Department of the Interior will take a major step toward reaching its goal of 4.5 million additional acr of wetlands under Federal control. The Department's 7-year pr gram contemplates acquisition of approximately 2,950,000 acres land—about two-thirds of the ultimate goal of 4.5 million acre Of this total, about 1,200,000 acres will be for new migratory wate fowl refuges or additions to existing refuges. The remaining 1,750,0 acres will be for waterfowl production areas in the Prairie State 600,000 acres of which will be acquired in fee and 1,150,000 acr covered by easements to assure preservation of the wetlands cha acter of the areas. The types of habitat in the 2,950,000 acres be acquired will be about 78 percent for waterfowl breeding and nes ing areas, 6 percent for resting and feeding areas during migration and 16 percent for wintering areas.

## *Approved New Waterfowl Refuge*

The Migratory Bird Conservation Commission approved t acquisition of lands for five new waterfowl refuge projects. T proposed Anahuac National Wildlife Refuge, in southeastern Texas Galveston Bay with an eventual area of 9,907 acres, will preserve important segment of brackish marshes vital to waterfowl populatio in the Central Flyway and provide a partial replacment for their fa disappearing wintering habitat. The proposed Alamosa refuge, in t San Luis Valley of south-central Colorado with an eventual acrea of 9,429, will provide an important waterfowl migration, productio and wintering area in an area where waterfowl habitat is bei rapidly destroyed.

The Davis Island refuge, in Mississippi on the Mississippi River ne Vicksburg, will contain about 26,000 acres when completed. It w serve as a resting, feeding, and wintering site for ducks as well as he to reestablish the southward flight pattern of the Canada goose in area where destruction of valuable waterfowl habitat is continuin The proposed Delevan refuge, of 5,664 acres in the Sacramento Vall of California, will help meet the paramount need for waterfowl winte ing areas in the Pacific Flyway by providing additional feeding a resting acreage to attract and hold large numbers of waterfowl duri critical periods.

The proposed Eastern Neck Refuge on the Eastern Shore Maryland, with an eventual acreage of 2,071, will meet the need for refuge in this part of the Atlantic Flyway by providing feeding are for ducks and geese. It will be of major importance to the har pressed diving ducks. The Commission also approved the additio of 9,389 acres of land to seven existing national refuges in seven State

## *Four National Refuges Established*

Four new national wildlife refuges were established during the year. The Ottawa refuge, Ohio, on purchased land on the shore of Lake Erie near Toledo, contains some of the best remaining waterfowl habitat in Ohio and will insure maintenance of marshes essential to waterfowl. The Wyandotte refuge, Michigan, established by congressional action on small islands of the public domain in the Detroit River, is in one of the most important concentration points in the Nation for diving ducks and is an important feeding ground for black ducks.

The Davis Island refuge, Mississippi, is considered a primary wetland area of particular importance to waterfowl. The refuge was established during fiscal year 1962 by the withdrawal and reservation of 70 acres of public domain. It eventually will contain approximately 6,000 acres, as approved by the Migratory Bird Conservation Commission. The Harris Neck refuge, Georgia, of 2,687 acres in McIntosh County, a former Army airfield acquired from General Services Administration, will serve as a feeding, resting, and wintering ground for migratory waterfowl, especially Canada geese, and its establishment is another step in providing an adequate chain of refuges along the eastern seaboard.

## *Fifteen National Refuges Activated*

The following national wildlife refuges have been staffed and placed under active administration since January 1961:

Modoc refuge, California, 6,050 acres, is in an area where chanelization of portions of a river and agricultural land-drainage operations had materially reduced former waterfowl habitat. Pixley refuge, California, 4,244 acres, and Kern refuge, California, 10,544 acres, near the southern end of the Central Valley, are jointly administered. These refuges will be valuable feeding areas for wintering waterfowl. Klamath Forest refuge, Oregon, 20,358 acres, is an important waterfowl production area, especially for diving ducks. Fish Springs refuge, Utah, 17,872 acres, is a natural nesting area for waterfowl and shorebirds, but in recent years water diversions caused large areas of the marsh to become dry.

Ouray refuge, Utah, 7,498 acres, will provide a much-needed production and management area to preserve the Great Basin Canada goose, native to Wyoming and eastern Utah. Benton Lake refuge, Montana, 12,383 acres, established in November 1929 by Executive order on public domain had remained undeveloped, awaiting an assured water supply, which is now completed. It had been an important waterfowl breeding area for both the Central and Pacific

Flyways and served as a feeding and resting area for waterfowl duri spring and fall migrations. Pocasse refuge, South Dakota, 6,000 acr lies directly on the Missouri River flight lane and will attract a la number of migrant ducks and geese. It is in a latitude sufficien north to ensure the retention of breeding birds.

DeSoto refuge, Iowa and Nebraska, 6,994 acres, on both sides the Missouri River, will restore waterfowl resting and feeding habit The area is also being developed for summer recreational use. Was ita refuge, Oklahoma, 17,680 acres, is on the Foss Reservoir develop by the Bureau of Reclamation. Wapanocca refuge, Arkansas, 7,9 acres, one of the last wetland areas in the Memphis, Tenn., regi will serve as an excellent "stepping stone" for geese and ducks their migration along the Mississippi River. Catahoula refuge, Lo isiana, 5,308 acres, was established October 1958. Its waterfo habitat had largely been destroyed by oil pollution and waterfo use of the area had declined markedly. Management of this i portant refuge will encourage the return of greater numbers of duc and geese to the area and the Mississippi Flyway.

Choctaw refuge, Alabama, 4,250 acres, was established in coope tion with the Corps of Engineers and the State of Alabama on t backwaters formed by the Jackson lock and dam. It will mitiga losses to wildlife resources and recreation from the flooding of valua bottom-land environments by construction of the dam. Mackay land refuge, North Carolina and Virginia, 7,856 acres, in the hea of the famous Back Bay-Currituck Sound waterfowl area, attra the largest wintering concentration of greater snow geese remaini in North America. Erie refuge, Pennsylvania, 2,727 acres, first Fe eral refuge in Pennsylvania, lies in the westerly portion of the Atlan Flyway and is used by ducks and geese migrating from the Huds Bay area to the Atlantic coastal marshes.

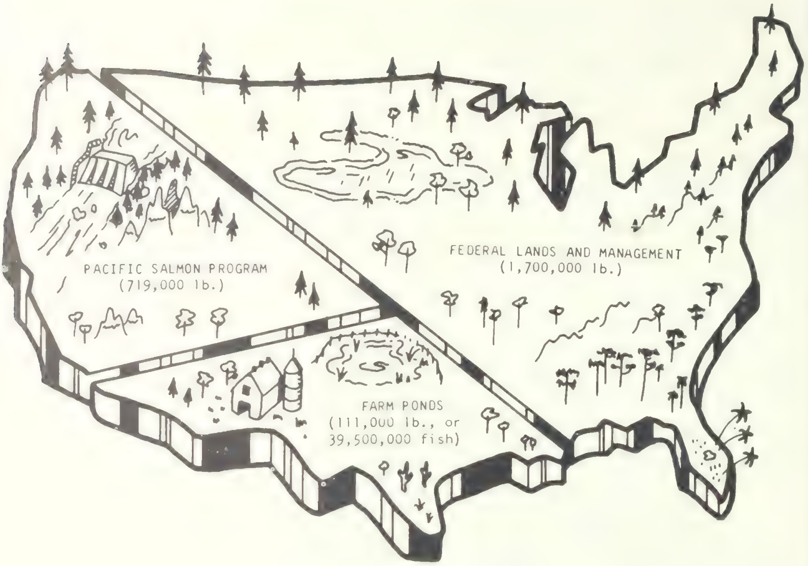
## *Preserving Fishery Resources of Inland Waters*

For almost 90 years the U.S. Government has been directly asso ated with efforts to preserve the fishery resource of the Natio inland waters. Today, within the national fish hatchery system, mo than 100 stations produce the fish species required to help maint this resource. Efforts of the Bureau of Sport Fisheries and Wild are concentrated on providing fish to stock waters on lands un Federal ownership or control, to assist the States in stocking pub waters, and to make fish available for initial or replacement stock in farm and ranch ponds. The ultimate goal of these efforts to p serve and enhance the fishery resource is to make available the great possible recreational opportunities for the American public.

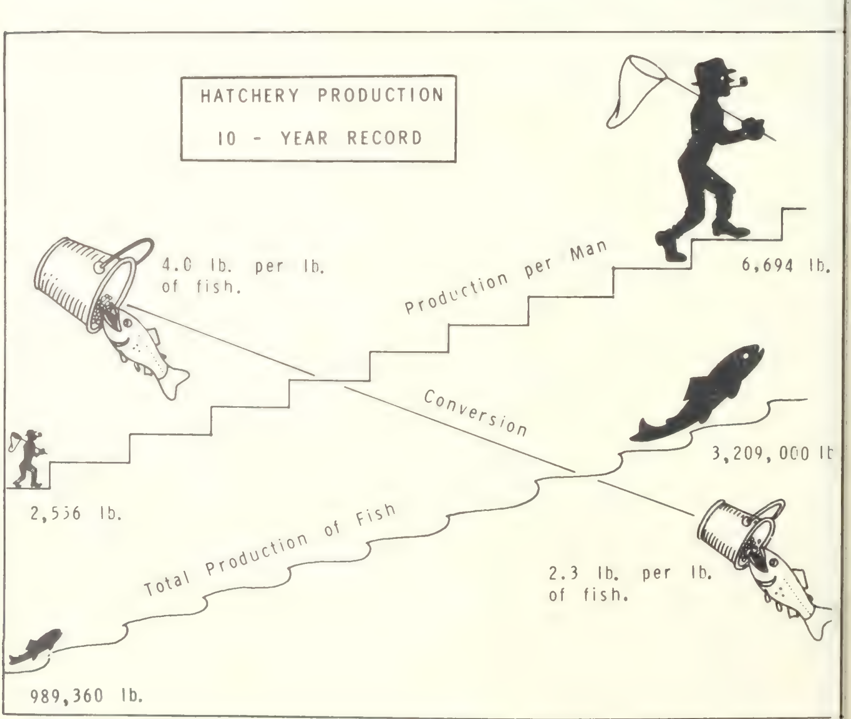
*ypical fish distribution unit of the Bureau of Sport Fisheries and Wildlife.*
*ring fiscal year 1962, some 215 million fish were distributed from national*
*hatcheries.*

Production of fish must be coordinated with biological and manage-
nt investigations and related ecological, environmental, and other
earch studies in order to realize the maximum benefits from
tchery-produced fish. Thus, a coordinated effort on the part of
rious components of the Bureau, as well as the cooperation of
ier Federal and State agencies, is required. The production, rear-
;, and distribution of these fishes is the direct responsibility of the
anch of Fish Hatcheries. In carrying out that responsibility, the
anch established three new records in the past production year:
e highest average production per man, 6,694 pounds of fish; the
st conversion rate on record, 2.3 pounds of food to 1 pound of fish;
d the highest total production, 3,209,110 pounds of all species—a
-percent increase over the previous year.

While significant advances were being made in fish production
ious management or operational improvements were realized in
ier segments of the national fish hatchery program. Three in-
vice training schools continued to provide advanced training to fish



DISTRIBUTION OF FISH PRODUCED AT NATIONAL FISH HATCHERI



nutrition, fish pathology, and fish-cultural techniques. To date, a total of 186 Federal employees, principally from the Federal fish hatcheries, have successfully completed training at these schools. This program is a vital part of an overall effort, including recruitment of increased numbers of college graduates and expanded use of the student trainee program, to improve the caliber of the profession of fish culture.

In addition, greater use was made of mechanized or specialized equipment to reduce or eliminate time-consuming jobs and to enhance fish-cultural practices; efforts were directed to improve dietary controls, while better foods and feeding techniques reduced fish production costs; special attention was given to improvement of brood stocks which has resulted in healthier, gamier fish; and programs such as the recently initiated internal publication, The Dorsal Fin, assist in widening the scope of communications throughout the national fish hatchery system. Continuing investigations relating to the problem of trout hepatoma were conducted on several national fish hatcheries. Progress to date has produced valuable information on dietary aspects of trout production.

## *New Fish Hatcheries Under Construction*

In fiscal year 1962, Congress provided funds to begin construction of four new national fish hatcheries at Greers Ferry Dam, Ark., Jordan River, Mich., Lahontan, Nev., and Wytheville, Va. Additional funds were appropriated to continue construction of three other hatcheries authorized in recent years: Alchesay, Ariz., Garrison Dam, N. Dak., and Gavins Point, S. Dak. These stations will make significant contributions. The potential annual production from these seven hatcheries alone is estimated to be 100,000 pounds of lake trout; 495,000 pounds of brook, brown, and rainbow trout; and about 14 million warm-water fish, including northern pike, walleye, bass, bluegill, and channel catfish. In addition to the construction of these new hatcheries, funds were also provided for repair, modernization, or expansion of 12 existing hatcheries.

## *Fish and Wildlife Restoration*

Under the Federal programs to assist the States to restore their fish and wildlife populations, each State and territorial fish and game department receives a portion of the funds collected through Federal excise taxes on sporting arms, ammunition, and fishing tackle. The amount available to a State is determined by formulae based on relative area; that is, the ratio of State area to that of the United

*Water analysis plays an important role in modern fish-cultural operatio At the Lyman, Miss., National Fish Hatchery 4 million warm-water fish bass, bluegill, redear sunfish, and channel catfish, are produced annua These fish are stocked in farm ponds and other impoundments in Mississi and Louisiana.*

States, and the number of paid fishing and hunting license holders i the State. State agencies select, initiate, and—after Fede approval—complete work on research, land acquisition, or develo ment projects. The State may later be reimbursed up to 75 perce of the total cost by the Federal Government.

Funds available for fish restoration since January 1961 total $7,985,000, and moneys apportioned for wildlife restoration, $24,089,2 These figures include all funds made available during fiscal year 19 and a partial apportionment for fiscal year 1963. Obligations fish restoration were 45 percent for research, 36 percent for habit development, 13 percent for land acquisition, and 6 percent administration. Comparable percentages for wildlife projects we for research, 26 percent; development, 51 percent; land purchase lease, 17 percent; and administration, 6 percent.

The wildlife program has been in operation for 25 years and t fisheries program for 11 years. Emphasis on wildlife research h clined as essential management data were gathered and put to use. here has been a concurrent increase in obligations for land purchase d development. Research still constitutes the major expenditure the fisheries program. Lands actually acquired under both pro- ams for fiscal year 1961 totaled more than 147,000 acres. Land oject obligations for 1962 were comparable to those for the previous ar. Thus since July 1960 about a quarter million acres of fish and ldlife lands have come under State ownership through the Federal d programs.

## ontinental Scope of Migratory Game Bird Studies

Migratory game bird surveys, inventories, and banding projects e conducted throughout the United States, Canada, and Mexico r the purpose of gathering current information on the status of the source. The gathering, evaluation, and application of these data e basic to the annual migratory bird hunting regulations. In operation with the State game departments, Canadian Wildlife rvice, Provincial game departments, Wildlife Management Institute d Ducks Unlimited, the Bureau makes intensive aerial and ground rveys of migratory waterfowl on the Canadian breeding grounds to termine population trends, effects of hunting pressure, causes of ortality, and other data essential to management of the resource. tensive banding programs are carried out in Canada and the United ates to clarify the routes taken by game birds from their breeding ounds to the flyways and to determine the annual mortality. inter inventories are conducted throughout the United States and exico to determine the population of migratory game birds following e hunting season. The continental scope of this activity testifies its importance. There are no more intensive or extensive wildlife rveys in the world than those conducted on this continent, and the reau is by far the principal agency involved in the program.

Surveys of dove populations, as well as woodcock, jacksnipe, rails, d gallinules have not been conducted on the same scale as water- wl. The importance of these species to hunter and nonhunter ike is increasing rapidly and there is more need than ever to improve e work being done in this field. Techniques for surveying these ecies are being developed and will soon be available for field use.

The banding of waterfowl and doves has been stepped up in the st 5 years. The Bureau is in the second 5-year cycle of waterfowl nding on the breeding grounds in Canada and the remaining work ere will gradually shift to the more northern areas where transpor- tion problems are more difficult and banding more expensive. At e same time the banding program for waterfowl in the States has

*The woodcock is a popular game bird with east-coast hunters. Its habit*
*sitting "tight" and protective coloring complicate the censusing of its numbe*

been and will be expanded in accordance with cooperative plans ma
by the interested Federal and State agencies.

## *Enforcing Game Laws*

On May 5, 1961, 45 Federal game management agents in compan
with State wardens arrested 161 individuals in the States of Marylan
North Carolina, Virginia, Louisiana, and Arkansas. Those arreste
were charged with the illegal possession, transportation, and sale
migratory waterfowl and resident game. During fiscal year 196
of 113 defendants brought to trial, 109 were convicted and charge
against 4 were dismissed. Fines imposed by the Federal distri
courts ranged from $1 to $750, jail sentences from 2 days to 1 yea
and active probation from 1 to 5 years.

Conventional enforcement activities of Federal game manageme
agents during fiscal year 1962 resulted in the apprehension of 6,04
persons found by the agents to be in violation of Federal or Sta
game and fish laws. In addition, Federal game management agen
participated in the apprehension of 2,028 persons for violation
State wildlife conservation laws; 2,021 of these cases were terminate
in State courts with $65,543.07 in fines and costs assessed along wit
2,039 days of jail sentences; $5,640 of the fines and costs and 1,74
days of jail sentences were suspended.

The following table compares the frequency of violations of fish and wildlife conservation laws administered by the Bureau of Sport Fisheries and Wildlife in the fiscal years 1961 and 1962.

| | Fiscal year 1961 | Fiscal year 1962 |
|---|---|---|
| Cases pending at beginning of year | 715 | 866 |
| New cases | 5, 119 | [1] 4, 017 |
| Cases terminated: | | |
| Declined | 286 | 180 |
| Dismissed | 192 | 170 |
| Acquitted | 184 | 69 |
| Nol pros | | 15 |
| Won | 4, 250 | 3, 757 |
| Cases pending at end of year | 922 | 657 |
| Fines and costs: | | |
| Suspended | $8, 484. 60 | $16, 371. 95 |
| Paid | $150, 168. 04 | $112, 634. 97 |
| Jail sentences (days): | | |
| Suspended | 6, 247 | 8, 970 |
| Served | 3, 335 | 2, 583 |
| Probation (days) | | 143, 395 |

[1] Includes 80 cases in which agents recommended "no prosecution."

## *Town-Owned Wetlands Studied*

In 1961, the Fish and Wildlife Service completed its studies of town-owned wetlands along the south shore of Long Island in New York State. These studies were initiated in 1957 by the Bureau of Sport Fisheries and Wildlife in cooperation with the New York Conservation Department at the request of local town officials. The joint report of the Service and the State conservation department, released in September 1961, provides recommendations for preservation and future development of fish and wildlife resources on more than 14,000 acres of town-owned marshes and their integration with other existing and future recreational uses.

Early in 1962 an abbreviated version of the joint report was prepared by the Bureau and published as an illustrated brochure by the New York Conservation Department with the endorsement of the State's Regional Fish and Wildlife Advisory Board and its Marine Fisheries Advisory Committee. An initial printing of 20,000 copies was made available for public distribution.

## *Emergency Feeding of Wildlife*

During the past winter, extremely heavy snowfall in several States deprived resident game birds and animals of their natural food supply. The States affected immediately took advantage of the provisions of Public Law 87–152, approved on August 17, 1961, by the 87th Congress, which authorized the States to requisition Government-owned grain for use in feeding wildlife threatened with starvation. Bureau representatives inspected the areas declared to be in need of emergency

*The magnificent trumpeter swan, once so rare it was near extinction, o*
*its remarkable comeback to public alertness and cooperation and to a natio*
*refuge, the Red Rock Lakes refuge in Montana, established expressly for*

feed, substantiated the situations as claimed, and assisted the Sta
in obtaining the grain. Approximately 5¼ million pounds of Co
modity Credit Corporation grains were made available to the Sta
for wildlife feeding programs.

## *Thousands See Trumpeters on Loan*

Trumpeter swans have now been placed in 24 public zoos and ins
tutions located in all regions of the United States, having an estima
total attendance of more than 25 million annually. These forme
endangered waterfowl were supplied on a loan agreement in or
that millions of citizens, who otherwise might never see a trumpe
except in a museum case, may now have the thrill of observing
living grace of America's largest waterfowl.

## *Refuge Visitors From Far Places*

The number of foreign visitors has increased considerably si
January 1961. Visitors to these refuges included conservation offici

rom such distant points as Australia and the Belgian Congo and a umber of students from African countries. Prince and Princess oshimaro Yamashima of Japan visited the Brigantine National Vildlife Refuge, N.J., in June. The Prince is president of the udubon Society of Japan.

Visitors on the national wildlife refuges in 1961 showed a 3-percent ncrease over the visitor-days of public use in 1960. This increased ecreational use, however, is below the 10-year average which has een public use of refuges climb from 3½ million in 1951 to more than 11 million in 1961.

### Storms Damage National Refuges

The location of many national wildlife refuges on or near large odies of water poses problems of a varied nature. In September 961, Hurricane Carla did extensive damage to the Aransas and aguna Atascosa National Wildlife Refuges in Texas, the Sabine and acassine National Wildlife Refuges in Louisiana, and the Gulf Island ational Wildlife Refuge in Mississippi. This hurricane added orrential rainfall and flooding on refuges in Oklahoma and Missouri. otal damage exceeded $300,000.

The Ash Wednesday storm of March 6–8 battered east-coast efuges. A combination of hurricane-force winds and high spring des caused damage to national wildlife refuges from New Jersey to eorgia estimated at more than $1.5 million. Facilities, such as ikes, levees, roads, and buildings, can be replaced. The rehabilitaon of habitat on these areas is most crucial, since there are no areas take their places in providing suitable sanctuary for migrating aterfowl of the Atlantic Flyway.

## Wildlife and Fishery Research

### Challenges Spur Wildlife Research

Five challenging developments of growing interest to the public ourred wildlife research in 1962.

Foremost among these is recognition of the importance of outdoor ecreation to people from urban areas and the contribution wildlife akes to this popular means of escape from the pressures of daily ving.

Second is the recent surge in international awareness of the plight many rare and endangered species of wildlife and the determination find means of preventing their extinction.

Third is an awakening realization that modern civilization creat new hazards, such as radioactive fallout, pollution of our streams, an the contamination of fields and forests with the residues of pesticide More and more people are expressing concern about the effects of thes substances on wildlife as well as on human health.

A fourth is that of potential dangers to the public resulting fro close association with wild animals that may be vectors of disease Many forms of wildlife are reservoirs for pathogens which may transmitted to humans and domestic animals if not kept under contro These include such diseases as rabies, ornithosis, tularemia, equi encephalitis, and tick fever.

Still another development of growing magnitude is the realizatio that although wildlife constitutes one of our most cherished natur resources, some forms of animals can constitute a liability as well an asset and must therefore be kept under moderate control. The five areas of concern have been impelling forces behind much of t wildlife research program during the year.

## *Expanded Research on Pesticide Hazards*

Public awareness of hazards associated with the increased use pesticidal chemicals is reflected in expanded research on a wide variet of insect pests. Programs for the control of grasshoppers, gyps moths, Dutch elm disease, Japanese and white-fringed beetles, an spruce budworms are recognized as necessary. Nevertheless, the raise serious questions of how we can better control such pests witho serious harm to fish and wildlife resources. Wildlife research measuring not only the effects of currently used pest-control material but also is testing the effects of new compounds that show promise greater selectivity against target species. Woodcock and robin vulnerable because of their worm diet, and the bald eagle because its high fish diet, may be particularly susceptible to certain of t chlorinated hydrocarbon insecticides, such as DDT, which may concentrated in these food organisms. The goal is to encourage ne pesticidal chemicals that are specific in action and to prescribe sa application techniques whereby necessary pest control can be acco plished without serious harm to fish and wildlife.

From studies on chronic effects of DDT on cutthroat trout appears that fish do not store as high concentrations of the chemi in their body tissues as do some other forms of wildlife. Instead, t greater accumulations are found in the brain of the fish. Simil studies are underway on the effects of 2,4-D on bluegills.

Continuing investigation of the long-term effect of DDT sprayi on the aquatic insect fauna of Swan Creek in Montana shows tha although recovery takes place, the population structure changes. During 1961, field studies were conducted in connection with a number of large-scale control programs: Alabama, on tent caterpillar; South Carolina, on alligatorweed; North Carolina, on elm spanworm; Montana, on spruce budworm; Wyoming, on alfalfa weevil; and Florida, on fire ant.

New chemicals are introduced in great number and variety. It is ncreasingly clear that, although spectacular fish kills may occur from ime to time, long-term, chronic effects may constitute the main danger. Assessment calls for painstaking and multifaceted approach: pathological examination of organs; residue analysis of tissues, of water, and of bottom materials; long-term observations of exposed ish to measure the effects on growth, health, and reproduction; and observations on the effects of chemicals on the food chain.

In the search for effective control chemicals that will do little or no harm to fish, one of three chemicals used in or proposed for fire ant control was found to be relatively nontoxic when tested on red ear sunfish.

## Progress in Control of Disease Carriers

Recent research also has been concentrated on the problem of tracking down natural reservoirs and means of spread for equine encephalitis on the eastern shores of Maryland. In cooperation with technicians from the Army Medical Service, Bureau biologists have conducted studies on most wild species of the area and have tested innumerable insects to determine their role as disease vectors. While this research has not yet been completed, it has already set a standard for a similar approach to other serious wildlife-borne diseases of man and domestic animals.

Significant progress has been made in reducing the incidence of rabies in wildlife in parts of the Southeast, Midwest, and Southwest, and a new program for this purpose has been established in West Virginia.

## Wildlife Damage Prevention Advances

Public demand for the control of animal damage constitutes one of the most difficult of the wildlife management problems. Many of the birds that cause serious local damage during periods of high concentration are valuable assets elsewhere. Bird hazards to aircraft range from the Laysan albatross at Midway to the gull and starling nuisance at many continental airports in the United States. Likewise, robins cause severe damage to holly groves in the West, and damage by blackbirds to rice and corn is widespread throughout many

*Three tons of waterfowl taken from market hunters in North Dakota U.S. game-law-enforcement agents. But for the market hunters, these bir would have provided many hours of enjoyment for licensed waterfowl hunte*

States. Current research on methods of control places major en phasis on prevention of damage rather than actual reduction in bi populations. During depredation control operations carried on the Bureau, 46,300 bushels of Government-owned grain were fed waterfowl to prevent crop damage caused by the birds.

*he broadcasting of bird distress calls over mobile sound units such as this e has proved effective in dispersing large flocks of birds at city dumps and the farmers' fields.*

*mobile sound unit broadcasting bird distress calls disperses a large flock f gulls.*

*More than one-fourth of all contamination and loss of grain due to rodents occurs because of inadequate storage conditions on the farm.*

When lethal control measures are necessary, they must be selective so that other animals will not be needlessly endangered. Such research includes the development of new and improved methods for the control of destructive mammals, chiefly in agricultural, forest and rangeland areas. Animal damage constitutes a continuing problem, and research is necessary to provide new and better techniques that utilize the latest advances in scientific technology, ranging from the use of electronic and ultrasonic devices to new chemosterilants and anesthetic agents.

Contrary to widespread popular notions that the larger mammals particularly the predators, are vanishing, nearly all are increasing in numbers. Texas is currently experiencing a substantial increase in coyotes and higher numbers have been noted in most of the West Cattle losses have been severe in many areas not previously subjec to heavy damage. Intensified efforts have helped to hold down losse even though overall populations of destructive animals have continued to spiral upward. Particular success has resulted from widespread use of the Bureau-developed mechanical burrow builder for controlling pocket gophers. Hitched to a tractor or farm vehicle, th machine cuts a tunnel below the surface, intersecting natural runways and depositing measured amounts of bait. Since pocket gophers leave no open holes into their burrows, previous methods of ocating their tunnels and placing bait were tedious and often unsuccessful. Use of the burrow builder has prevented major damage to agricultural crops, pastures, and reforestation projects in many parts of the Midwest and West.

The Bureau continued to participate in the clean grain program of he Food and Drug Administration. North Carolina, Kentucky, Ohio, and the Dakotas have established statewide programs with noteworthy savings in stored grain as well as reduced losses from contaminated grain being diverted or condemned.

## *Marine Game-Fish Research Moves Ahead*

Launched in 1961 with the establishment of an Atlantic coast research center at Sandy Hook, N.J., the marine game-fish research program has made significant progress. A special statistical evaluation of salt-water angling was completed which gives for the first time the national dimensions of this sport. It shows that 6 million salt-water anglers caught 633 million fish, among which were 80 million weakfish, 42 million croakers, and 22 million flounders. The aquarium for experimental culture of marine fishes at the center has been completed. Two heavily fished species in the New York-New Jersey area—summer and winter flounders—are the first subjects for experimental studies of development and survival of young under different conditions. In the summer and early fall of 1961 the Laboratory undertook a systematic study of the distribution, abundance, species composition, and food habits of sharks and other big-game fishes from southern New York to northern Delaware.

*The Atlantic Marine Game Fish Research Center, Sandy Hook, N.J.*

*Secretary Udall delivers dedicatory address at Sandy Hook Marine Laboratory, Atlantic Marine Game Fish Research Center, September 28, 1961.*

The Sandy Hook Laboratory has also become the focal point fo divers interested in conservation and underwater natural history b helping to found the American Littoral Society. Members of th society make periodic fish counts and observations of fish behavio and environmental conditions.

The new Pacific research center at Tiburon, Calif., located on Sa Francisco Bay in an area of extensive sport fishing for salmon, stripe bass, and bottomfish, was activated. Extensive marine facilities ar available at Tiburon and excellent deepwater dock and mooring bulkheads, with ample storage space and expansion potential. Durin the year, information was compiled on the extent, facilities, location of fishing, and kinds of fish caught on the Pacific coast. This information has been transposed to a series of 20 charts, which will b published in atlas form.

A small but important part of the marine research program is th accumulation of life history information on important game species It is accomplished by financing graduate studies of outstandin marine biology students on behavior, feeding, distribution, an migration. Three students are now employed in this program.

*The research vessel* "Cape May" *was loaned to the Bureau of Sport Fisheries nd Wildlife in the fall of 1961 for a systematic study of marine game fish long the Atlantic coast. Twelve Federal and State agencies and private nd educational institutions interested in fishery research cooperated.*

## *Reservoir Investigations Initiated*

Public reservoirs comprise 13 million acres of water—more than all f the natural lakes and ponds in the United States—and projections ndicate this vast acreage will double by the year 2000. In 1960, 96 nillion man-days of fishing took place on reservoirs—25 percent of the ational total. By the year 2000, reservoirs are expected to absorb ne-third of the total fishing effort.

Although they are constructed primarily for other purposes, the act that reservoirs are so quickly sought out for recreation illustrates n extraordinary and increasing thirst in our expanding society for utdoor recreation on or near water. The tremendous expansion in eservoir area in the last three decades has been an unexpected onanza in meeting these demands. These huge impoundments are reservoirs of recreation as well as of water. Unlike natural lake however, successful management for fishing calls for new knowledg and skills. With their fluctuating levels, heavy sedimentation, strang patterns of flow, of chemistry, and of temperature, reservoirs pos new and unusual problems profoundly influencing the fisheries bot in the impoundments and in the rivers below.

Two centers for reservoir research recently have been establishe at Yankton, S. Dak., and Fayetteville, Ark. The first center wi study fish populations and ecology of the main-stem reservoirs of th Missouri River in Nebraska, South Dakota, North Dakota, an Montana. Some of the largest reservoirs in the country are locate here, including Fort Randall, Oahe, Garrison, and Fort Peck. Th South Central Reservoir Investigations was established in the sprin of 1962. This center focuses on the White River complex of reservoi in Arkansas and Missouri: Bull Shoals, Norfolk, Table Rock, an Beaver Creek (under construction). To accelerate initiation of r search, a contract was arranged with the University of Arkansas i February 1961 to make a preimpoundment study of the Beaver Cree reservoir site for comparative purposes.

## *Fish and Wildlife and Outdoor Recreation*

The growing interest in outdoor recreation makes it necessary f the Bureau to give closer attention to the production and utilization waterfowl and other migratory birds. To this end, the Migrato Bird Populations Station was established at the Patuxent Wildli Research Center, Laurel, Md., in fiscal year 1962 to consolida activities related to the analysis of band records, hunting season ki and wing analysis for the improved management of this importa resource.

Greater attention is also being devoted to measures for the prote tion of endangered species, which constitute only a small part of t total wildlife population but nevertheless contribute a great deal the esthetic enjoyment of wild creatures by many nature lovers. T increased emphasis on the preservation and restoration of endanger birds is being approached through research on artificial propagati and stocking techniques. This program was given added impet late in the year when 30 nene were received in quarantine from En land on their return to Hawaii to bolster a seriously depleted natur flock. These Hawaiian geese, from the Wildlife Trust, Slimbridg England, are living proof that a wild population can receive valuab support from hand-reared recruits. Investigations were also start

*Iore than 14½ million hunters spent more than 192½ million days in the eld, in 1960. By the year 2000, it is expected that the number of hunters ı this country will more than double.*

n the propagation of sandhill cranes from eggs taken from the wild. 'his pioneer work may be applicable to the whooping crane and other ıre species after some of the preliminary problems are solved.

In certain parts of the country, particularly in the vicinity of the ıajor Canada goose concentrations, new management measures are eing used to control the harvest properly and to improve distribution f the kill and quality of the hunting. Personnel directly involved ı Canada goose management programs feel that substantial progress as been made in this respect during the past 5 years by State and 'ederal agencies concerned.

## *orest Wildlife Studied*

The recreational note is sounded also in some of the forest wildlife esearch studies. The objective of this work is to assist the U.S. 'orest Service and other land management agencies in multiple orest use by improving wildlife habitat. As a phase of this research, Bureau biologist reviewed timber management plans of the U.S. tudy Commission, Southeastern River Basins, for 55 million acres f land in four States to appraise the effects of management on wildlife nd to evaluate the lands in terms of wildlife potential for meeting resent and future recreational demands.

## *Farm Ponds Stocked*

Direct recreational benefits accrue from the national fish hatchery program as it relates to the stocking of farm and ranch ponds. During the past year fish were stocked in some 47,000 farm ponds, covering more than 97,000 acres. Based on average national statistical data these ponds will provide in excess of 3 million man-days of fishing.

*Farm ponds provide many hours of healthful recreation for farm youngsters*

## *Technical Aid to Sport Fishing*

Fishery management activities of the Bureau significantly increase recreational fishing on Federal lands and Indian reservations this year These cooperative efforts resulted in 2.6 million man-days of fishing o 198 installations of the Department of Defense, Veterans' Administration, Forest Service, National Park Service, Indian tribes, and th Bureau's national wildlife refuges.

Looking toward greater development of sport fishing on militar installations in the future, the first cooperative plan for the management and development of fish and wildlife resources on those areas as authorized by the Congress under the "Sike" Act, has been place in effect. It was approved for the McChord Air Force Base, Wash May 17, 1962. Similar plans are being developed for other militar areas throughout the United States, involving the Department of th Interior, the Department of Defense, and the fish and game departments of the respective States.

*Opening day at a new fishing lake at Fort Benning, Ga.*

A fishery cooperative unit was established at the University of Utah n January 1962. It is the first in a series of similar units to be developed by the Bureau in cooperation with the universities and the State fish and game departments to meet future demands for greater recreational fishing opportunities. The project will emphasize the training of qualified fishery workers for employment with State and Federal agencies. Research leading to improved sport fishery management will be conducted.

*Sport fishing on Federal lands and Indian reservations that resulted from cooperative fishery management activities*

| Area | Number of installations | Days of fishing |
|---|---|---|
| Federal areas: | | |
| Department of Defense: | | |
| Air Force | 25 | 113, 619 |
| Army | 57 | 205, 487 |
| Navy and Marine Corps | 22 | 58, 308 |
| Veterans' Administration | 8 | 22, 680 |
| National forests | 11 | 695, 626 |
| National parks | 10 | 39, 400 |
| Wildlife refuges | 29 | 1, 071, 798 |
| Miscellaneous Federal areas | 3 | 16, 900 |
| ndian reservations | 33 | [illegible] |
| Total | 198 | 2, 559, 011 |

## *Future Fishing Needs Analyzed*

A report, "Sport Fishing, Today and Tomorrow," was complete
under contract with the Outdoor Recreation Resources Review Con
mission. The report concludes that over the period 1955 to 1960 th
numbers of fishermen in the United States increased at the rate of 4
percent a year, which is 2.5 times faster than the population of th
Nation is increasing. The number of fishermen is expected to i
crease 50 percent by 1976 and 150 percent by 2000 from the 25
million reported in 1960. By the year 2000, 63 million anglers w
fish about 1.3 billion days. The report shows that the increase
fishing demand can be met (1) by adding new waters in the form
ponds and reservoirs, (2) by better management of existing waters, ar
(3) by more fishing in coastal waters.

*Each year sport fishing attracts more than 25 million Americans, 12 ye
and older, who spend collectively about 500 million days engaged in one
the Nation's most important participation sports.*

## *National Survey of Fishing and Hunting*

The second national survey of fishing and hunting in the United States was made in 1961 for the calendar year 1960. It showed that these traditional American activities are even more significant now than they were in 1955, the year covered by the first survey. The 1960 survey revealed that 50 million of the 130 million people in the Nation 12 years old and older went fishing, hunting, or both in 1960. This survey further revealed that, of the 130 million people in the United States over 12 years of age, 30 million participated in one or both sports in a substantial way and that these people spent nearly $4 million on these sports. This "National Survey of Fishing and Hunting" was published in September 1961. That the 25,000 copies in the initial printing are nearly exhausted attests to the value of this survey to the fish and wildlife interests of the Nation.

## *Impact of New Reservoir Policy*

The Department of the Interior and the joint Army-Interior reservoir land acquisition policy, adopted February 22, 1962, gave impetus to the President's program, as set forth in his 1961 message on natural resources, to permit the present and future development of recreational opportunities at federally financed reservoirs.

The new policy provides for fee-title acquisition of land to the maximum flowage line rather than the relatively narrow strip acquired in fee under the previous policy, adopted in 1953. Excepted are those lands which do not have substantial value, existing or potential, for recreation or fish and wildlife purposes. The new policy also provides for fee acquisition of additional land above the maximum flowage line needed to meet the evergrowing present and future requirements for fish and wildlife development and management.

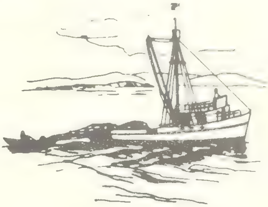
Establishment of the new policy has set in motion a review of all reservoir projects, including those already authorized but not yet constructed, reservoirs currently under construction but not yet completed, and reservoirs now in operation, to determine the measures that are needed to assure present and future needs for development and management of fish and wildlife resources. Reservoir projects presently in the planning stage are being given most careful consideration from this point of view.

Lands acquired at Corps of Engineers and Bureau of Reclamation projects in previous years that have already been made available to the States and to the Fish and Wildlife Service total nearly 2 million acres—about 950,000 acres to the States and 934,000 acres to the Fish and Wildlife Service. Current planning at existing and proposed reservoir projects, which, of course, is subject to change in light of the new policy, contemplates an additional 780,000 acres to be made available to the Fish and Wildlife Service, primarily for waterfowl development, as part of its national wildlife refuge system.

Current planning also contemplates that a considerable acreage of land at reservoir projects will be made available to the various States for administration and management of upland game, big game, and waterfowl by the respective State game and fish departments. Most of these lands will be managed as public hunting and fishing areas. The potential for this program is not fully known at this time, but it is certain that implementation of the program will be greatly facilitated as a result of adoption of the new land-acquisition policy.

# *Bureau of Commercial Fisheries*

## Donald L. McKernan, *Director*



The responsibilities of the Fish and Wildlife Service's Bureau of Commercial Fisheries for the Nation's fishing industry include all aspects of resource management and many aspects of production and marketing which lead the Bureau into numerous fields of research and the use of results therefrom. The ultimate objectives are accomplishment of the Department of the Interior's conservation policies of wise use of the Nation's fish and shellfish resources; a prosperous fishing industry; production of a wholesome, nutritious food supply; and development and production of industrial and pharmaceutical fish products of high quality.

Fields of research include biology, population dynamics, oceanography, chemistry, food technology, economics, market statistics, electronics, engineering, exploratory fishing, and gear development.

Each field of research provides information essential for the attainment of the Bureau's objectives. Many fields of specialization in biology—embryology, histology, physiology, serology, virology, to name but a few—are used to obtain better reproduction and growth of fish and shellfish, combat diseases, and identify subdivisions of species of oceanic stocks.

Oceanography provides the explanations for the distribution and abundance of commercially valuable fishes, and with this knowledge it is possible to forecast where and in what quantities certain species of fish may be caught.

Chemistry is used to develop new and better fish products for both food and industrial uses. Food technology investigations provide new and better ways of preparing, packaging, storing, and marketing fish products.

Economic investigations supply information on all aspects of pr duction, processing, distribution, and marketing. The methods statistics and biometric analysis are used in studying populatio dynamics, and in economics and in statistical market reports.

Electronics and engineering are used primarily in guiding an passing fish around or over obstacles such as dams, and to observ behavior of fish and fishing gear. Exploratory fishing locates ne stocks of commercially valuable fish and shellfish; gear researc develops improvements in fishing gear.

## *Research and Development*

Our research in the many fields of science and of harvesting fish directed toward solving specific problems of the fishing industr Some problems on which the Bureau has made significant progre in the past year are described briefly on the following pages.

### *Biological Oceanography*

The Bureau of Commercial Fisheries has played a major part developing plans for an international oceanographic and fishe research program in the equatorial Atlantic Ocean starting in Janua 1963. Nine other U.S. agencies will join this Bureau in a survey the equatorial Atlantic between the Africa and South America coast Several foreign countries have expressed an interest in participatin A principal objective of these investigations is to obtain informati that will aid in the harvest of fish to feed the people of protei deficient countries bordering both sides of the equatorial Atlant Utilization of immediately available fishery resources will be important factor in alleviating serious nutrition problems in countri which are unable to produce sufficient quantities of protein-ri foods for human consumption.

The Bureau's Biological Laboratory at Washington, D.C., responsible for immediate supervision of the Bureau's part of t research. As presently planned, the Bureau's research vessel *Gero imo* will be one of 12 vessels engaged in the program. Two 15-d surveys will be made in the period February 15–April 3, 1963, and o in the period August 1–15, 1963. Vessel operations will be coordinat closely so that similar observations are made throughout the equator Atlantic during the three 15-day periods.

Although the Bureau's interest centers mainly on biological ocea ography, other cooperators will be gathering data on all aspects oceanography—physical, chemical, biological, meteorological, aer gical, geological, and geophysical. Future research in the equatorial Atlantic will be guided by the results of this cooperative effort.

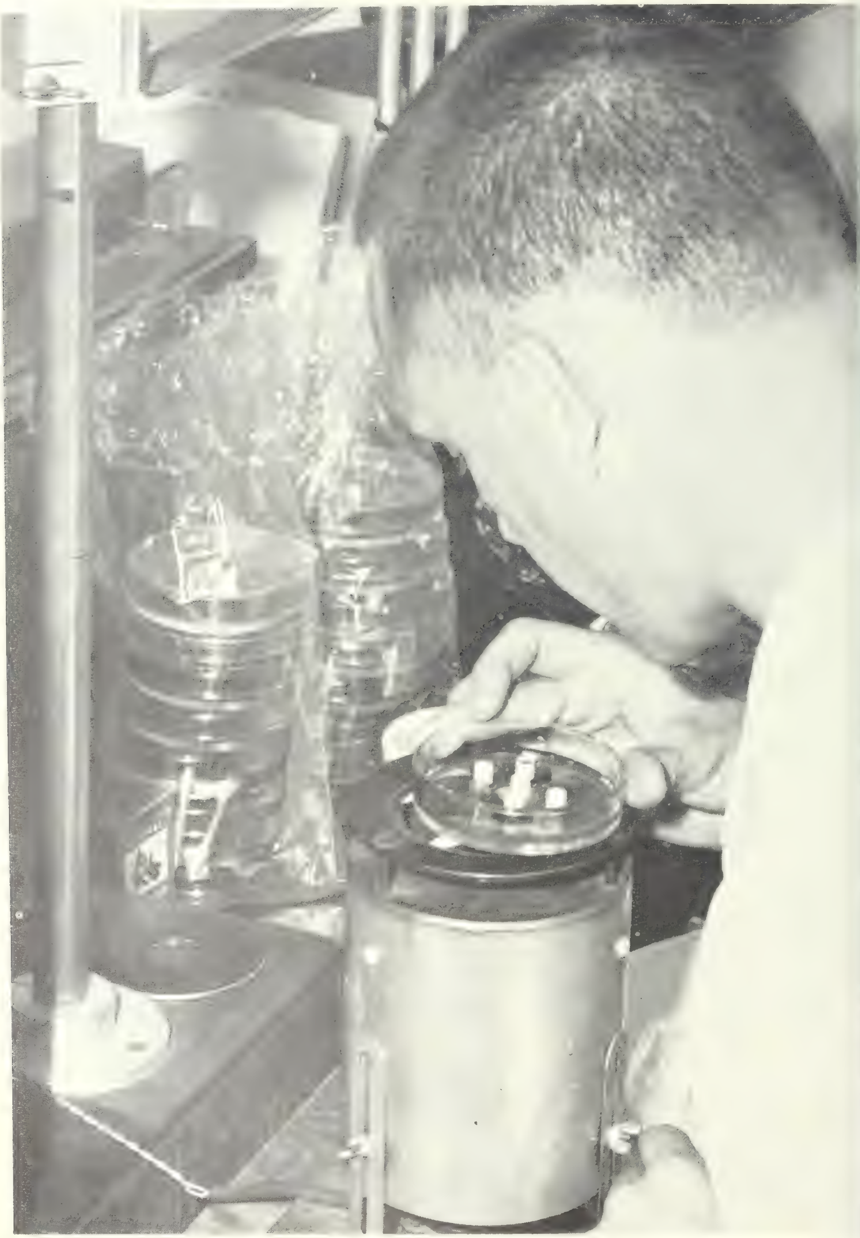
## *Salmon*

Efforts to restore and protect valuable runs of Pacific salmon increased during the past year. A 2-year emergency research program in Alaska is nearing completion. Information necessary for successful renegotiation of the International North Pacific Fisheries Convention is the major objective. We have increased our knowledge of how many fish should be allowed to spawn in order to sustain maximum red salmon runs in Bristol Bay rivers. We have learned that red salmon spawn to a depth of 100 feet in some lakes and that the number of young salmon which a lake can support varies widely.

Our ability to predict the size of salmon runs improved with the expansion of tagging and sampling programs in the central North Pacific and Gulf of Alaska. Our first winter survey cruise located a significant concentration of immature red salmon in a broad area from 100 to 200 miles south of Kodiak Island. Red salmon were far more numerous in the gill-net catches than chum or pink salmon. In the red salmon catches larger and older fish were more abundant in northern latitudes. In winter, salmon were taken on all stations north of latitude 46° N., and the distribution pattern was similar to that found in summer, approximately 2° farther to the south.

Demand for electric power in the Pacific Northwest has stimulated private and public power agencies to propose construction of a high dam in Snake River canyon. There are several possible dam sites near the mouth of the Salmon River, a principal tributary of the Snake River and one of the major salmon-producing tributaries in the Columbia River basin. Up to this time, construction of a dam near the mouth of Salmon River has been avoided because methods of successfully passing both upstream and downstream salmon and steelhead migrants over a dam more than 100 feet in height are not known, and a dam constructed there would cause irreparable damage to the valuable fish runs of the Salmon River.

At the start of fiscal year 1962 this Bureau began an accelerated research program which seeks to develop methods for passing salmon and steelhead migrants successfully at high dams. The research is being conducted cooperatively by State fishery agencies of California, Oregon, Washington, and Idaho, and this Bureau. Studies are in progress on behavior of small and mature fish, and on methods of collecting and passing upstream and downstream migrants over dams. Louvered barriers and electrical fields show promise as means of deflecting downstream migrants to safe avenues of passage.



*Laboratory worker examining serological plate. Blood samples taken from fish and analyzed by serological techniques permit research workers t identify origin or races of fish. For example, it appears possible to determin by this method whether a red salmon caught in the North Pacific came from Asiatic or North American stocks.*

*Extremely rough, mountainous country in the middle Snake River canyon complicates design, construction, and operation of fish passage facilities.*

Devices for collecting downstream migrants in reservoirs are being improved. These collecting devices are, in effect, artificial surface outlets and are known either as gulpers or skimmers.

One of the knottier problems is posed by the apparent inability of small downstream migrants to find their way through the large, artificial bodies of water created by high dams. Although promising preliminary results have been obtained for a few of the problems, final answers to many problems have not been obtained.

In studies of endurance, steelhead trout and salmon have ascended an "endless" experimental fishway for elevations of more than 1,000 feet and one sockeye salmon climbed more than a mile. As a result of these experiments in the Bureau-operated Fish Passage Laboratory at Bonneville Dam, modification of conventional fishway design saved thousands of dollars in construction of fishways at Ice Harbor Dam. Further savings will accrue in construction of fishways as other dams are built.

### *Albacore Catch Prediction*

Increased efficiency in the albacore fishery has been brought abou by a new program of forecasting albacore abundance. A carefu study of historical and current data on albacore distribution and se surface water temperatures has shown a high degree of correlatio In "cold" years albacore move farther south than usual, resulting i high catches south of the United States-Mexican border. Monthl and semimonthly maps of sea-surface temperatures in the easter Pacific are now being published for use of fishermen in determinin areas where albacore are most likely to be caught. Other chart showing details of ocean bottom topography along the Central an South American coasts, are being prepared for the tuna fleet. Thes show seamounts and banks where it is known that tuna congregat to feed.

### *Shrimp*

The technique of staining shrimp with colored dyes has been a important development in shrimp research. Dyed shrimp release in the estuaries have been recaptured on fishing grounds of the Gu of Mexico, demonstrating that shrimp may migrate long distanc and that estuaries are necessary to the maintenance of oceanic shrim populations.

Stained shrimp were first successfully released at sea during th fall of 1961. Live stained shrimp were lowered to the bottom in large closed box. Scuba divers opened the box and watched as th shrimp burrowed into the soft bottom. Marking and recovery studi have provided, for the first time, actual measurements of growth ar mortality rates on shrimp. Preliminary results with marked pir shrimp on Tortugas and Sanibel grounds indicate rapid growth ar high mortality. Similar experiments with brown and white shrim are underway. Correct sizes for harvesting maximum yields can determined from such studies.

### *Sea Lamprey and Lake Trout*

The sea lamprey has virtually destroyed valuable stocks of la trout in Lakes Huron and Michigan since it first invaded the upp Great Lakes in the 1930's. Lake trout in Lake Superior were decrea ing rapidly when an all-out attack on the sea lamprey was launch with a newly developed selective chemical toxicant in 1958.

All streams known to be infested with sea lamprey larvae we treated by 1961. The selective treatment did not harm game fi but eradicated lamprey larvae and led to an 80- to 90-percent redu tion in numbers of adult sea lampreys returning to spawn in th

*obile bioassay laboratory in which streamside tests are made to determine act amounts of selective chemical toxicant that will kill sea lamprey rvae but not other species of fish.*

pring of 1962. This large reduction in numbers of adult sea lampreys evidence that control is being achieved.

Rehabilitation of the highly prized lake trout population is well nder way in Lake Superior. Nearly 6 million hatchery-reared lake out were released in the lake from 1958 to 1962. These fish were roduced in State, Fish and Wildlife Service, and Province of Ontario atcheries. Millions more are to be planted each year until the opulation is restored. Survival has been excellent, and in many eas of the lake the hatchery-reared lake trout, marked by clipped ns, outnumber wild lake trout. As control of the sea lamprey is chieved, protective management measures are being started to onserve the small natural spawning stock of lake trout that remains.

Success in controlling the sea lamprey in Lake Superior has brought enewed hope for Lake Michigan, where lake trout also have become rtually extinct and other commercial species adversely affected. ith the lake trout nearly gone, sea lampreys began preying on the rger species of chubs. A 2-year survey of the chub stocks of Lake ichigan, completed in 1961, showed that two of the larger species chubs may be extinct and the abundance of others greatly reduced. he small, slow-growing bloater chub, once the main food of lake trout, now constitutes over 90 percent of the fish population of Lake Michigan. Loss of lake trout and large chubs was a serious blow to the fishing industry. The industry has had to fall back on the small bloater chubs, alewives, and smelt for which prices are low and markets small.

Restoration of desirable species in Lake Michigan has begun. Sea lamprey larvae were eradicated in 26 tributary streams during 1960–

*Biologists measuring changes in the species composition of Lake Erie fis stocks where pollution was found to be responsible for drastic declines o commercially valuable species.*

61. Small trial plantings of hatchery-reared lake trout have bee quite successful. These fish have survived well, have disperse throughout the lake, and have grown rapidly.

Studies to find causes of drastic declines of blue pike and walley in Lake Erie have produced evidence of marked environmenta changes. Various chemicals related to domestic and industrial waste flowing into the lake have increased steadily in recent years causin evere depletion of dissolved oxygen in bottom waters over thousands f square miles of the lake. Dramatic changes have occurred in bundance of fish-food organisms living on the bottom. Pollution-olerant worms have increased 4,600 percent and aquatic larvae of a mall fly that can withstand low-oxygen conditions have increased nore than 500 percent since 1929. The bacterial load at the outlet f the Detroit River increased threefold between 1913 and 1946–48.

Cisco, whitefish, and blue pike, that once thrived in the cool, clean vater of central Lake Erie, have all but vanished from the oxygen-lepleted waters. These species once contributed from 10 million to early 50 million pounds each year to the commercial catch, but in ecent years only a few thousand pounds have been landed.

It is now evident that much of Lake Erie may no longer be a good abitat for walleye and yellow perch. Less-desired but more-tolerant pecies, such as carp, white bass, sheepshead, smelt, gizzard shad, and lewives, are more abundant. In addition, reports of large numbers f dead fish of all species have become increasingly common in recent ears. Recent surveys have shown that at times no fish are present n areas where they once were abundant.

## *Blue Crab*

Hand labor in the blue crab processing industry is expensive. In n effort to reduce costs of processing, the Bureau began a study to levelop methods for mechanization. A contract was let to an engieering consulting firm to determine which steps in the processing ould best be mechanized. The principal problem is that of producing machine-picked meat equal in quality to handpicked meat. Mahines for preliminary processing will be developed first and the ctual picking machines later.

To aid the industry in immediately reducing processing costs while nechanization studies are underway, the same consulting firm conlucted time-motion studies. These studies led to recommendations for ost-saving improvements in present hand-processing methods.

## *Radiation Preservation of Fishery Products*

The program of low-level radiation preservation of seafoods has nade significant advances. Irradiation of fresh haddock fillets and oft-shell clams indicates that the shelf life of these products can be xtended 1 week or more.

Quality changes due to irradiation appear to be negligible. Further tudies are underway on the effects of irradiation on the amino acids nd vitamins in these products.

## *Fish Protein Concentrate*

A new project to survey methods for producing fish protein concentrate for human food was begun during the year. Fish protein concentrate is a powdery substance made from fish. This product contains all the essential amino acids necessary for normal growth as wel as many of the minerals and vitamins necessary to maintain body health. The aim of this project is to determine whether various processing methods now in use will yield a satisfactory, but inexpensive, product. If known processes are found to be inadequate, the study would then include the development of a satisfactory process

Surveys have been made of the more important methods being developed in South America, Canada, Europe, and the United States Enzymatic digestion coupled with solvent extraction appears to be the most promising approach.

## *Fish Oils*

A new analytical technique, thin-layer silicic acid chromatography has been developed to separate the many substances in fish oils. This technique has permitted significant advances in the Bureau's fish oi research and extension into new fields. Chemical components of fish oils now can be supplied to researchers in medicine, nutrition, and other fields.

Many authorities in nutrition and heart disease believe that the unsaturated fatty acids may be important in the prevention of some types of heart disease. The method also is being used to identify these unsaturated fatty acid components or fractions of fish oils, and those fractions which contain the characteristic fish odor.

## *Exploratory Fishing*

Vessels of the Bureau's exploratory fishing fleet operated off the Atlantic and Pacific coasts, in the Gulf of Mexico, Caribbean Sea and Great Lakes.

Experimental midwater trawling for ocean perch by the research vessel *Delaware* revealed that this species ascends from the bottom and scatters during darkness. At night only small and unprofitable quantities can be captured by present midwater trawls because the fish are scattered. Therefore, the fleet must remain idle on fishing grounds at night. Significant quantities of desirable sardine-sized herring were caught by midwater trawling in New England waters.

Good trawling grounds for yelloweye snapper were located by the Bureau's vessel *Oregon* in the western Caribbean Sea off the coast o Nicaragua at 70 to 110 fathoms. During the Caribbean work, numer-

*Ultraviolet recording spectrophotometer being used for chemical studies on fish oils.*

us small schools of blackfin tuna were observed throughout the area explored.

Explorations by the Bureau's vessel *John N. Cobb* and charter vessel *Commando* off the Columbia River are giving increasing evidence that commercial forms of fish and shellfish may occur to depths of at least 00 fathoms in this area. Large catches of sablefish and Dover sole at well over 300 fathoms have aroused considerable interest among the commercial fleet regarding techniques which will enable the fleet to harvest these forms in the deeper waters of the continental slope. The apparent abundance of tanner crabs on bottoms 275 to 500 fathoms deep suggests strongly that commercial quantities of these crabs may be harvested along the continental slope from Oregon to British Columbia. These observations were obtained in the course of investigations made under contract with the U.S. Atomic Energy Commission.

Explorations in waters of the Gulf of Alaska located commercial quantities of Dungeness crab between Lituya Bay and Icy Bay. Commercial fishing on these previously unknown stocks commenced soon after they were located. Bureau efforts to foster development of a fishery for underutilized and unutilized species in the Great Lakes, which have replaced the more valuable species, were strengthened considerably with the commissioning of the Bureau's 65-foot exploratory fishing and gear research vessel *Kaho*. The *Kaho's* first exploratory trips were made in Lakes Michigan and Erie.

### *Graduate Educational Grants*

One of the principal requirements in developing the national oceanographic program is the need for well-trained research scientists. The Bureau of Commercial Fisheries took steps in 1962 to meet this need by awarding 17 grants for support of graduate students in marine science. Fields of study selected for support were physical, chemical, and biological oceanography, fishery biology, taxonomy, and food technology. Criteria for awards were developed in consultation with faculty representatives of universities with major programs in these fields. These consultants also assisted in selecting colleges and universities to receive the grants.

Recipients of awards will be selected by the universities. Each grant includes tuition, fees, and a living allowance. Grants were made to the following institutions: University of Washington, Oregon State University, University of California at San Diego, University of Hawaii, Texas Agricultural & Mechanical College, University of Miami, Duke University, the Johns Hopkins University, Yale University, University of Rhode Island, University of Michigan, and Massachusetts Institute of Technology.

## *Conferences*

The United States hosted the FAO International Conference on Fish in Nutrition in Washington, D.C., in September 1961. The main objectives of the Conference were to bring together scientists in the fields of nutrition and fishery technology to evaluate what is known about the role of fish in nutrition and to facilitate orderly planning for future research in these fields.

The Conference was attended by more than 300 scientists from 35 countries and international organizations. Present knowledge was summarized in 33 review papers supported by 35 original scientific and technical contributions. Abridged and edited proceedings of the Conference, including all reports and discussions, will be published soon.

### *Oceanographic-Instrumentation Symposium*

The United States is embarking on a long-range national oceanographic program of research and exploration. One of the most critical needs in this program is for new and improved instruments. To define the needs and to encourage industry to help solve them, the Government-Industry Oceanographic Instrumentation Symposium was held in Washington, D.C., in August 1961. The Symposium was sponsored by the Interagency Committee on Oceanography (ICO) of the Federal Council for Science and Technology. The Bureau of Commercial Fisheries played a prominent role in the planning for the meeting, which was held in the Department of the Interior Auditorium.

The Symposium was attended by 540 representatives from industrial concerns with an interest in oceanographic instrumentation, 139 representatives from Government, 32 from nonprofit institutions, 22 from the press, 4 from embassies of foreign countries—for a total of 737 attending. Since the meeting there has been a continued flow of proposals from the industry for the development of new instruments. Judging by the keen interest shown on the part of industry, the meeting was quite successful.

## *Services to Industry*

In cooperation with the domestic fishing and allied industries and with State and other Federal agencies concerned with resource utilization, the Bureau provides regional and national educational and marketing programs. The purpose of these programs is to increase the utilization of fishery products.

Other services to the commercial fishing industry included development of standards, fishery product inspection, advice to cooperatives, production of motion pictures, television and radio announcements, and publications to promote consumption of fish, fish-cookery demonstrations, statistical surveys, and distribution of daily and monthly reports on fishery activities.

*Bureau of Commercial Fisheries home economist demonstrates fish cooker to school lunchroom supervisors and cooks. Over 3,000 such demonstration have been given since this program began in 1946.*

## *Motion Pictures*

An industry-financed, Bureau-produced, educational motion picture "Fishing Five Great Lakes," was completed and another, "Waterme of Chesapeake," was started during the year. Twenty Bureau-produced fishery educational motion pictures are now in national distribution through about 180 cooperating film libraries and Governmen distribution channels. Most of the costs of production were paid b industry.

The annual viewing audience for these films is more than 2 millio persons, exclusive of the audience exposed to public service televisio showings. Bureau motion pictures received two international an three national film festival awards during the year. Since 1946 th Department has received 18 international and national film festiva awards for Bureau-produced educational motion pictures.

## *Promotion of Underutilized Fish*

The Bureau continued to push aggressively in developing market for underutilized fish. Markets were further expanded in the pe and mink industries, with a resultant increase in utilization of a numbe of fresh-water and marine fishes. Several major pet-food companie are now seriously considering expansion of existing production faciliti and construction of new pet-food plants in the Great Lakes and Gul areas.

Market development and technical assistance were given the Arkan- as fish-farming industries to aid in the commercial production and tilization of fish grown in flooded ricelands. Fish crops are rotated ith rice crops. The 1 to 2 million acres of lowland farms in Arkansas nd adjacent States offer a tremendous fish-producing potential, stimated to be as high as 250 million pounds of fish annually, which ould be used for human and animal food. At present, only a small ortion of this potential is being utilized. This represents a vast otential reservoir to meet the future food needs of our expanding opulation.

### *Statistical Reporting*

In January 1962, the Bureau began a new service to industry by ssuing its first advance report on the fishery statistics of the United tates. The report contained a preliminary review of landings and ther fishery statistics available at the end of calendar year 1961.

A program of binding monthly and annual landing bulletins was ndertaken for historical research purposes. Monthly and annual ulletins of landings for New York, New Jersey, and Florida, and of hrimp landings were bound for deposit in Bureau and State offices nd laboratories and in the libraries of several universities.

The publication, Commercial Fishing Gear of the United States as released during the year. This was the first systematic arrange- ent, by type, of gear used by U.S. fishermen.

### *Market News Reporting*

The Fishery Market News Service provides all segments of the shing industry with current information on supplies, movement, istribution, demand, prices, and market conditions. Speed and ccuracy are essential in disseminating these data. Fishermen, uyers, sellers, and distributors largely base their marketing decisions pon information contained in market news reports issued daily by he seven Fishery Market News Service offices. These offices are cated at Boston, New York City, Hampton (includes data from altimore), New Orleans, San Pedro, Seattle, and Chicago.

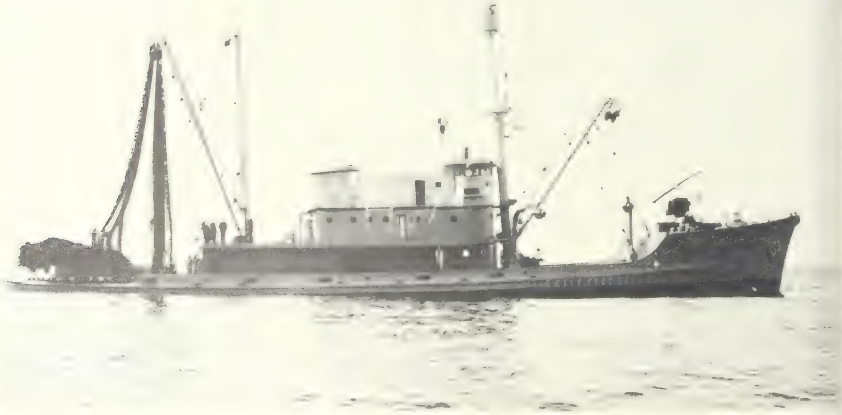
A special report on New England sea scallops was published by the oston Market News Service office. It includes a brief history of the shery, an analysis of trends from 1939 to 1960, and a summary of nportant developments that affected the sale of scallop meats in omestic and foreign markets.

Special articles and news of fishery trends and progress in all hases of fishery research in the United States and abroad are pre- ented in the monthly periodical, Commercial Fisheries Review.

News of trends and developments in foreign fisheries, transmitted by the Department of State from foreign reporting posts, are published in the daily Fishery Products Reports and Commercial Fisheries Review. More detailed reports on foreign fisheries are distributed to United States fishing interests upon request.

## *Fisheries Loan Fund Program*

The fishing industry again received aid under the Fisheries Loan Fund Program authorized by section 4 of the Fish and Wildlife Act of 1956. New applications for 210 loans, totaling $3.9 million were received during the fiscal year. The backlog of cases being processed was 32 at the beginning of the year and 29 at the end of the year. One hundred and ten applications, for a total of $2.5 million, were approved and 54 for a total of $1,285,000 were declined or found to be ineligible. Twenty-eight applications were withdrawn by applicants before final decisions were reached. Principal and interest collected during the year totaled $2,070,000.



*This tuna purse seiner, largest in the world, was converted from a former Navy minelayer with the assistance of the Fisheries Loan Fund.*

These loans were made for financing and refinancing of operations, maintenance, repair, replacement, and equipment of fishing gear and fishing vessels. Commercial sources of financing for fishing vessels remained very scarce due to demand for financing by other industries and the depressed condition of the fisheries.

### *Fishing Vessel Mortgage Insurance Program*

A companion program provides for insurance of mortgages and loans allowed for construction or reconstruction of fishing vessels. Ten applications, amounting to $1,621,000, were received during the fiscal year. Six applications were approved for a total of $1,090,000. One case was pending at the beginning of the year and four cases were pending at the end of the year. One application was withdrawn by the applicant.

### *Fishing Vessel Construction Subsidy Program*

The purpose of the subsidy program is to provide financial assistance to correct inequities between foreign and domestic costs of fishing vessel construction. The first construction differential subsidy was approved during the year. Four applications for subsidies amounting to $409,500 were received during the year. Three were carried over from the previous year, and two were pending at the end of the year. Five subsidies, totaling $507,600, were approved. Actual payment of these subsidies will not be made until construction of the five vessels involved is completed. All vessels were designed for fishing in the New England groundfish fishery.

## *Developments in Foreign Fisheries and Trade*

Expansion of fishing effort on the high seas by many foreign nations is introducing new methods of marine fishing, and is leading to unusually rapid development of marine fisheries. These new methods utilize factory ship stern-trawlers, new and larger trawls, mothership operations, and fully integrated fleet operations that catch and completely process the fish at sea. The Bureau utilizes timely information on fisheries of foreign countries in its programs to keep the domestic fishing industry informed on these new developments. To assure that the U.S. Government and the domestic fishing industry are aware of the latest advancements in foreign countries, the Bureau operates, in collaboration with the Department of State, a foreign reporting program covering worldwide fishing events. Fishery attachés assigned to U.S. Embassies in Copenhagen, Tokyo, and Mexico City, report on latest fishery developments in their areas. Other important fishing areas of the world were covered by U.S. Embassy and consulate personnel. In addition, fishing activi-of the U.S.S.R., as well as newly created fishing opportunities in th African countries, were reported in monthly briefs issued by th Bureau.

The past year has witnessed Russian, Polish, and Norwegian fishin activities off the New England coast and Russian fishing activitie off the Middle Atlantic States. Japanese and Russian fleets continue to fish off Alaska. In addition, Japanese tuna fleets are operating i the Atlantic and plans are underway for Japanese vessels to tak groundfish in the northwest Atlantic.

### *Trade and Tariff Matters*

Formation of the Common Market in Europe and increased fisher production by several foreign countries have brough new challenge and trade problems for the fishing industry. To enable domesti fishery products to compete in foreign and domestic markets, th Bureau's trade and tariff specialists worked on committees concerne with international trade, and also prepared comprehensive, interpre tive market studies covering foreign regulations and controls o American fishery commodities. Actions were taken to seek the re moval of such restrictions.

A specialist in fishery trade matters was placed on the U.S. delega tion to the 1961 tariff negotiating conference held under the Gener Agreement on Tariffs and Trade (GATT). In another action, th regional fishery attaché for Europe was assigned as U.S. representativ to the Fisheries Committee of the Organization for Economic Cooper tion and Development, which has been studying problems of fisher trade among the 20 nations of this Atlantic community.

## *International Programs*

Through the U.S. FAO Interagency Committee, the Bureau aide in developing fishery programs of the Food and Agriculture Organiz tion of the United Nations. Although FAO's programs are mainl designed to aid newly developing countries move toward econom stability, many programs have contributed much to the progress the fisheries in more advanced countries. During this past year, owir in large part to the FAO International Meeting on Fish Meal hel in March 1961, domestic and international fishmeal markets we stabilized. FAO, principally at the instigation of the Bureau, is no conducting a program to increase consumption of fish protein concentrates in developing countries.

During the year the Bureau also made a 3-month survey of the isheries in West Africa for the Agency for International Development AID). The objective was to increase the supply and demand for ishery products in the developing countries of West Africa.

### International Conservation of Marine Resources

Providing for conservation and wise utilization of marine fishery resources, now being taken by U.S. and foreign fishermen in increasingly large amounts, is a major Bureau responsibility. Bureau officials participated in numerous international fishery meetings to guide rational exploitation of valuable oceanic species and, simultaneously, to protect the rights of U.S. fishermen.

International commissions where fishery issues are resolved include the International Whaling Commission, International Pacific Salmon Commission, International Pacific Halibut Commission, Inter-American Tropical Tuna Commission, North Pacific Fur Seal Commission, and the International Commission for the Northwest Atlantic Fisheries. At meetings of these commissions, Bureau officials have worked to protect the world's whale stocks; salmon, halibut, tuna, fur seal, and other resources of the Pacific Ocean; and fisheries for bottomfish and scallops in the Northwest Atlantic.

## Columbia River Development Program

The Columbia River Fishery Development Program, financed and supervised by the Bureau, is a cooperative program of the State fish and game agencies of Idaho, Oregon, and Washington, and the two bureaus of the Department of the Interior's Fish and Wildlife Service.

Started in 1949, the program has been instrumental in maintaining anadromous fish runs in the Columbia River despite extensive development of water-use projects. Twenty-one hatcheries have been renovated or newly constructed for artificial propagation of salmon and steelhead, to offset as far as possible losses of natural spawning and nursery areas.

In addition, irrigation diversions have been screened to prevent entry and losses of fish in such diversions; streams cleared to remove debris, old dams, and logjams; and fishways constructed at falls in an effort to develop and maintain all areas suitable for continued natural production of salmon and steelhead.

The program also constructed the Western Fish Nutritional Laboratory at Willard, Wash., and has financed a large part of the research performed there. During the year, an extensive study to evaluate the success of hatcheries was begun.

In the spring of 1962 approximately 8 million fall chinook salmon fingerlings, from all hatcheries rearing that species, have been marked by cutting off certain fins. Recovery of marked fish from the commercial and sport fisheries, and from hatcheries, will provide the basis for determining survival, harvest, and maintenance of runs. It is anticipated that approximately 10 million fish will be marked each year for the next 4 years. An extensive sampling program to recover marked adults will be conducted along the Pacific Coast, in the Columbia River, and at the hatcheries.

## *Fur Seal Operations*

In performing its function as administrator of the U.S. fur sea industry, the Department harvested 95,974 sealskins from the Pribilof Islands, Alaska, during the summer of 1961. This harvest, largest in recent years, stemmed from management practices based on research and bore out forecasts. Under the terms of the Interim Convention on Conservation of North Pacific Fur Seals, Canada and Japan each received 15 percent of the sealskins taken, plus 188 additional skins

During fiscal year 1962, 53,990 U.S.-owned sealskins were sold fo $2,742,758. Under the terms of the Alaska Statehood Act, 70 percen of the net proceeds from the sale of sealskins is payable annually to the State of Alaska. The third annual payment to the State, in the amount of $536,809, based on net proceeds accruing during fiscal year 1961, was made late in 1961.

On January 22, 1962, the Department notified the Fouke Fur Co that its contract for processing and selling sealskins as agents of the United States was terminated effective December 31, 1962. This company has processed and sold Alaska sealskins in St. Louis, Mo. under an exclusive contract with the United States for the past 40 years. The company has moved its sealskin processing operations to a new plant located in Greenville, S.C.

In June 1962 copies of an "Invitation for Proposals and Prospectus for Processing and Selling Alaska Sealskins" were distributed among a substantial number of fur processing firms, individuals, and organizations. The invitation asks for submission of proposals to the Department for providing services for processing and selling U.S.-owned Alaska sealskins. Proposals submitted in response to this invitation are expected to form the basis for a new sealskin processing contract.

*Removal of blubber is an early step in processing seal skins. Trained workers are shown performing this preliminary step in skin processing on St. Paul Island.*

## *Construction*

Construction of laboratories and vessels continued during the year. Completed were a major laboratory and its associated aquarium, a salt-water laboratory, and a research vessel. Another major vessel, the *Albatross IV*, was launched and will be completed in fiscal year 1963.

### *Biological Laboratory at Woods Hole*

The Bureau's new biological laboratory at Woods Hole, Mass., was dedicated on June 23, 1962. The original laboratory at Woods Hole was established in 1871. The new, well-equipped, three-story laboratory building has 24,000 square feet of floorspace. A second building houses an aquarium, primarily designed for experimental work on fish physiology and behavior.

In summer a portion of the aquarium is open to the public. Th public tanks and displays, first opened to the public in the summer c 1961, have proved highly popular. The astonishing number of mor than 200,000 persons visited the aquarium between July 1 and September 10, 1961.

The laboratory's dock facilities will accommodate oceangoin vessels, including the Bureau's new fishery-oceanographic researc vessel *Albatross IV*.

## *East Lagoon Salt-Water Laboratory*

Two important additions were made to the biological laborator at Galveston, Texas, during the year. One was a circulating sea water system at the main laboratory, and the other a sea-water laboratory at East Lagoon, which is located about 3 miles east of the mai laboratory. The sea-water laboratory is raised about 15 feet abov sea level to avoid hurricane damage. It is on a 40- by 90-foot concrete slab with a large concrete tank on the roof of the building Whereas the recirculating system at the main laboratory provide rather well-controlled conditions of salinity and temperature, th East Lagoon laboratory will give an opportunity, especially in th case of estuarine species, to study organisms under seminatural con

U S DEPARTMENT OF THE INTERIOR
BUREAU OF COMMERCIAL FISHERIES
GALVESTON BIOLOGICAL LABORATORY EAST LAGOON FIELD STATION

*New sea-water laboratory at East Lagoon, Galveston Island. Continuousl circulating sea water permits study of aquatic organisms under seminatura conditions.*

ditions. Studies of shrimp behavior and physiology are underway using these facilities.

## *Research Vessel "Kaho"*

The Bureau's vessel *Kaho* was commissioned during the year for research on the Great Lakes. This steel vessel resembles a Pacific-coast combination seiner-trawler. It is 65 feet in length and is equipped with the latest marine-electronic equipment, including radio, fish detection equipment, automatic electric hydraulic steering system, and radar. Deck equipment includes trawling and bathythermograph winches necessary for fishery explorations.

The *Kaho* will be used to locate and determine the potential commercial production of underutilized stocks of fish and develop the most efficient methods and gear to harvest them.

## *Research Vessel "Albatross IV"*

Construction is proceeding satisfactorily on the *Albatross IV*. This $1.7 million vessel has been launched and is in the final stages of completion. The 187-foot stern-chute trawler will operate from Woods Hole, Mass., as a fishery and biological oceanographic research vessel.

# *Office of the Assistant Secretary Mineral Resources*

## John M. Kelly, *Assistant Secretary*

Several new or expanded activities were undertaken by the Office of the Assistant Secretary for Mineral Resources in 1962 with respect to the Department's programs in research, development, and utilization of minerals, metals, and fuels.

With an objective of creating a unified policy to supplant the existing bureau-by-bureau approach, the Assistant Secretary established a Departmental Energy Policy Staff composed of representatives of various energy-related bureaus and offices. In taking an overall view of energy policy, the staff reviewed and commented upon staff studies of the National Fuels and Energy Study of the Senate Interior Committee and prepared energy reports for the use of the Department and other Federal agencies.

Other activities of the Office of the Assistant Secretary included the following:

Participating in petroleum committee meetings of NATO and the OECD in discussions centering about petroleum supply.

Participating in meetings of the International Lead and Zinc Study Group to examine market developments for lead and zinc during 1961 and to consider the outlook for 1962.

Meeting with domestic lead and zinc industry representatives as a part of an effort to establish continuing consultation with various segments of the mineral producing industries, and holding field hearings on the new lead-zinc subsidy legislation.

Assisting the Resources Panel of the National Academy of Sciences in drafting a report for the President covering the complete scope of existing and recommended natural resources research.

Participating on the Petroleum Study Commission established by the President to study the oil import program.

Assisting at departmental conferences aimed at establishing a basis for a survey of the damage to natural resources resulting from strip and surface mining.

Preparing background material and testimony for the Department on coal slurry pipeline possibilities, and on Federal eminent-domain legislation for such pipelines.

Making field studies and consulting with other Federal and State agencies concerning area redevelopment programs.

Coordinating U.S. activities in connection with the Second Symposium on the Development of Petroleum Resources of Asia and the Far East, scheduled for September 1962, at which the Assistant Secretary was to be the Chairman of the U.S. delegation.

Continuing reviews of proposals for minerals stockpile action and participating on the Executive Stockpile Committee.

Assisting in the clarification of mineral industry advisory relationships with government in relation to Executive Order 11007 and the Presidential memorandum of February 9, 1961.

Directing a panel of the National Academy of Sciences in selecting and preparing U.S. papers for the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas.

In discharging the mineral resource responsibilities of the Secretary of the Interior, the Assistant Secretary exercises continuing supervision over eight bureaus and offices of the Department: The Geological Survey, Bureau of Mines, Office of Oil and Gas, Office of Geography, Office of Minerals and Solid Fuels, Office of Minerals Exploration, Oil Import Administration, and Office of Coal Research.

# Geological Survey

## Thomas B. Nolan, *Director*

What new frontiers can the Geological Survey of the Department of the Interior explore to aid in the conservation of our natural resources and to help maintain this Nation as the world's most prosperous? This is a question constantly before us as we strive to think in terms of what our country's requirements for new maps, metals, minerals, mineral fuels, and water resources are going to be—5, 10, or 20 years from now.

For more than 83 years, the Survey has conducted basic research in scientific and engineering fields to provide the mapping, exploratory, and analytic knowledge needed for wise use of nature's gifts.

In preparing and publishing topographic maps, the search for new tools and techniques continues. Replacing the pre-World War II topographer, whose principal items of equipment were the plane table and alidade, is a modern scientist-engineer counterpart who uses a variety of precision optical and mechanical instruments to mass produce the greatly improved maps demanded today. Aiding him are aerial cameras with wide-angle lenses that collect a vast amount of information on each photograph; stereophotogrammetric plotting instruments that enable him to interpret and plot terrain detail with utmost accuracy; electronic distance-measuring devices that reduce the cost, toil and inaccuracies "pulling chain"; a vehicle-mounted electronic elevation meter which permits measuring differences in elevation with no more effort than is needed to drive an automobile; and vastly improved cartographic drafting and printing procedures that lend tremendous versatility in reproducing intermediate and final map drawings. During the past year, work has begun on a comprehensive national atlas, to be produced with the scope and of a quality suitable to the U.S. high position in scientific and technologic fields.

Exploration for and appraisal of mineral and water resources are never-ending tasks. Here too, new frontiers are not geographic, geologic or hydrologic alone, but involve new instrumentation and the fringe areas of many disciplines whose unexplored regions can yield valuable knowledge. Geochemists, geophysicists, mathematicians, and volcanologists are among Survey researchers exploring new approaches to the origin of ores and fuels. Such knowledge is vital to future success in seeking out sources of supply of minera raw materials and the maximum utilization of water resources.

The recent explosive growth in the use of a dozen or so elements that were hardly known outside the chemical laboratory a few years ago illustrates this point—beryllium, niobium, selenium, tellurium germanium. Magnesium, zirconium, and titanium are performing tasks either entirely new or formerly fulfilled by other metals. We would be in a bad way, indeed, so far as our reserves of needed materials are concerned, if it were not for technological advances not only in the development of new sources but in uses for different materials

Our recent extension of geologic research into areas formerly exclusive to oceanography provides another new frontier: one which geologists and hydrologists should have explored more thoroughly long ago. The study of geology should not stop at the seashore or even at the 100-fathom line. The broad aspects of new Survey objectives in marine geology and hydrology have been worked out These will be carefully integrated with the objectives and programs of other Government bureaus and educational institutions. Many prospective projects, though oceanographically oriented, are already tied in with the Survey's regular research program.

Finally, we believe we have found a workable solution to ou growing communication problem involving the time-lag between scientific discovery and public availability of new knowledge. Regardless of where the difficulties may lie, it is apparent that new facts known only to the discoverer are valueless to the using public. In 1960, Geological Survey began publishing short synopses of curren geologic and hydrologic research results, thus making the principa findings quickly available. Many of these short papers are followed by reports in greater detail in later publications. Though sometimes tantalizing to professional associates who want more information immediately, this practice of rapid publication has proved highly popular and is filling a longstanding need.

# *Geologic Division*

Full and efficient use of our mineral resources in the development of the national economy in this the latter part of the 20th century is dependent on an ever more detailed knowledge of the nature of these resources and the geologic processes that produce them. To that end the Geologic Division is engaged in a variety of scientific studies that range from analysis of samples from the depths of the Mohole or meteorites from extraterrestrial sources to broad-scale field investigations of geologic, geophysical, and geochemical phenomena in areas from the Arctic to the Antarctic, from the Atlantic seaboard to the Trust Territory of the Pacific Islands.

Several of these studies are undertaken on behalf of other Federal agencies, including the Defense Department, the Atomic Energy Commission, the National Aeronautics and Space Administration, the National Science Foundation, Agency for International Development, Bureau of Public Roads, and the Department's Bureau of Mines and Office of Minerals Exploration. Others are being carried out in cooperation with 15 States, the Commonwealth of Puerto Rico, the county of Los Angeles, and the city of Seattle.

## *Geologic Publications*

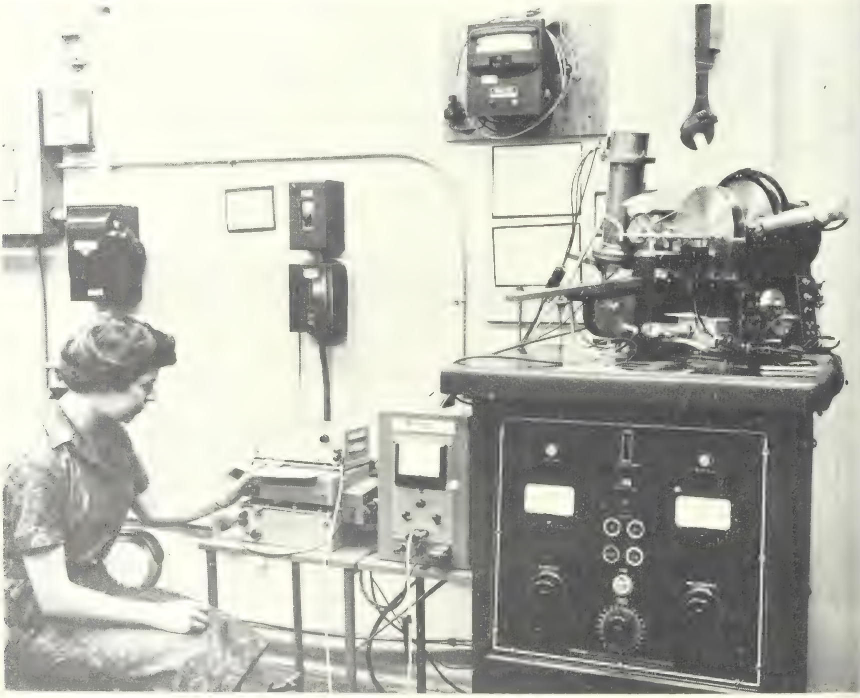
Results of the survey's Geologic Division's investigations were published during fiscal 1962 in 75 professional papers and bulletins, 3 circulars, 136 geologic maps, and some 190 technical papers in scientific journals. An additional 63 reports were made available in files open for public reference. Important findings and a synopsis of current research were published in Professional Paper 424–A, "Geological Survey Research, 1961," and 298 short papers summarizing results of individual studies in progress were published in chapters B, C, and D of that report. In order to present new findings as rapidly as possible, the first chapter of short papers for "Geological Survey Research, 1962" has been separately published, as Professional Paper 450–B. It includes 26 additional short papers on current research in the Division's studies.

## *Economic Geology*

Research and investigations in economic geology have an immediate application in filling current needs for mineral raw materials, in the solution of engineering problems and the guidance of land development, in guarding public health and safety.

During the past year, potential iron ore has been identified in a mineralized sequence of volcanic rocks in the northern [illegible] Moun tains, Nevada, and an iron-bearing formation up to 50 feet thick has been found in the Tobacco Root Range, Mont. The first known deposit of zinc minerals in Ohio has been found at Serpent Mount in the southern part of the State.

Abundant near-surface manganese minerals and alteration of associated rocks in the Drum Mountains, Utah, resemble closely the surface conditions overlying the rich silver-lead-zinc deposits in the Tintic mining district. In several other parts of the Southwest surface veins of manganese oxide minerals apparently may be used as a guide to significant amounts of lead, zinc, silver, and copper at depth. Variation in the thermoluminescence of white dolomite associated with zinc-lead-silver ore at Gilman, Colorado, suggests a possible new exploration tool.



*Geological Survey geologist measures thermoluminescence of a mineral—its ability to emit light when gently heated. Variations in thermoluminescence near ore bodies may provide a new exploration technique.*

A beryllium deposit of potential economic significance was discovered at Rapid River, Alaska, about 4½ miles from previously reported beryllium deposits in the vicinity of the Lost River tir mine.

In the Piedmont region of South Carolina, a correlation has been ound between regional zones of mineral deposits and hitherto unecognized regional metamorphic zones.

Uranium has been one of our most intensively studied raw materials uring the past decade and a half. Synthesis and analysis of the remendous amount of data acquired in these studies is now underway. n the regional and mining district studies on uranium, several ineralogical, geochemical, structural, and stratigraphic guides to ore eposits have been developed. For example, in the Moab-Interriver rea, Utah, a cobalt halo extends as much as 80 feet into the sandstone round one deposit. In uranium-bearing sandstones in the Disapointment Valley area, Colorado, and in the Shirley Basin of Wyoming, lack, opaque heavy minerals, normally present, are almost completely bsent close to mineralized rock.

Thorium-bearing veins in the Wet Mountains, Colo., are now found o be of Tertiary age, and not Precambrian as formerly supposed. his change suggests a broader area should be examined for similar eposits. Some of these veins also contain as much as 0.3 percent iobium.

Geologic mapping and detailed mineralogic studies at Searles Lake, alif., indicate the possibility that concentrations of saline minerals, oncealed beneath present-day playas, may be detected by studies f the stratification and mineralogy of exposed sediments peripheral o the basin.

Mesquite leaves and twigs have been found to accumulate zinc, ead, barium, and strontium, as well as the copper and molybdenum reviously reported. The usefulness of analyses of ash from mesquite s thus extended in the search for geochemical clues to hidden ore odies in the alluvium-covered areas of the Southwest.

In mineral fuels investigations, a significant new appraisal of the uture petroleum-producing capacity of the United States concludes hat our producing capacity is in no way restricted in the immediate uture by the remaining quantity of undiscovered oil, but is dependent rimarily on economic incentives that encourage exploration.

Potential resources in the oil shales of the Green River formation ave been increased by the discovery that the top 43 feet of the richly etroliferous Tipton shale member is continuous and relatively uniorm over an area of about 1,400 square miles in the southern part f the Green River basin of Wyoming.

Areas of recurrent or potential landslides pose special problems in lanning for urban development, in locating highways, and in other ajor construction problems. In the Malibu Beach area of Los ngeles County, newly available geologic maps that indicate landslide reas have proven very useful to public officials, real estate developers, and potential homeowners. Identification of ancient landslides along a proposed route of a major sewage disposal system for the Seattle metropolitan area resulted in selection of an alternate route. Studies in engineering geology also are helping in the selection of a highway route between Talkeetna and McGrath, Alaska.

Processes that change the shape of our shorelines have been studied in efforts to develop possible protective measures for use in areas o special interest. Short-term changes have been observed in detail to improve our ability to predict and possibly prevent undesirable changes.

Public health and safety are the primary objectives of studies on the disposal of radioactive waste, drainage of mine waters, and the distribution of various elements in nature that may be related to incidence of disease.

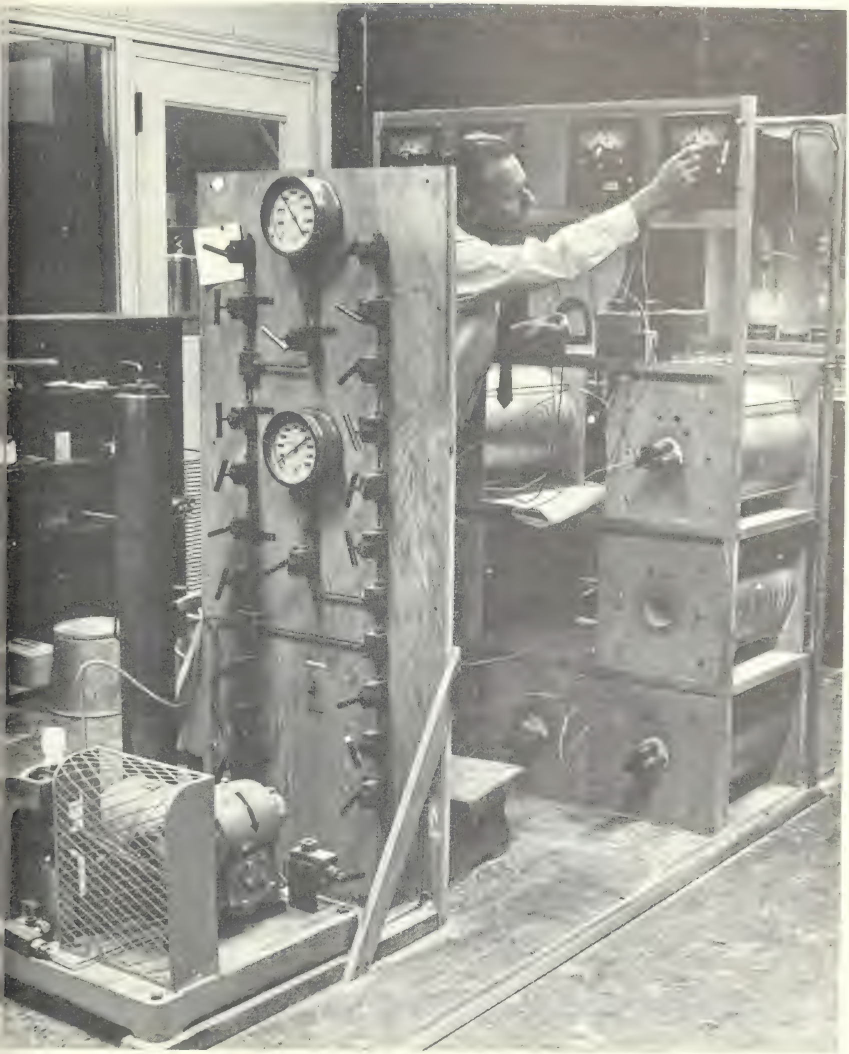
## *Regional Geology*

The earth's crust as we now observe it has been formed by a complex sequence of events. Basic to its understanding is an accurate record of its present state—the geologic map—from which can b inferred and interpreted relations at depth and the processes by which the present state was attained. Modern geologic mapping makes full use of geophysical, geochemical, and paleontologic studies t supplement direct observation.

Publication was authorized during the year of 200 geologic and geophysical maps. In addition to maps of specific areas, maps that summarize information on large areas are prepared. Published durin the past year was the tectonic map of the United States. This map prepared jointly with a committee of the American Association o Petroleum Geologists, shows the major structural elements and provides a framework for delineating major mineral provinces in th search for useful materials. A preliminary geologic map of Puerto Rico was made available to assist planning and development of mineral resources, including deposits of chemical-grade limestone and o copper minerals such as the one now being explored near La Muda Announcement last year of the identification of very thick deposits of low-gravity sediments favorable for the accumulation of oil in the basin west of Nenana, Alaska, attracted the attention of oil producers who have leased some of the area and are beginning exploration.

## *Experimental Geology*

Natural processes by which the many different kinds of rocks and minerals have been formed can be observed rarely—only when they occur at or near the earth's surface. Many rocks and minerals are



*Geological Survey geochemist is shown with hydrothermal equipment used o study the effects of steam and various other high temperature and pressure hemical environments on rocks and minerals to determine conditions under which minerals were formed.*

known to form at some depth in the earth under various conditions of eat and pressure and over extended periods of time. The processes f their formation can only be inferred, and detailed geochemical and eophysical experiments in the laboratory provide the basis

Isotopic analyses are becoming a standard method of providing ccurate age-dating of critical events in the development of the earth

During the past year announcement was made that the oldest minera yet found in the United States—a zircon from the Morton gneiss i southwestern Minnesota—is 3.2 billion years old.

Isotope studies of the migration of lead in metamorphic rocks offe an exciting new approach to the search for ore deposits. For exampl feldspar minerals near Bear Mountain, N.Y., contain an unusuall large amount of radiogenic lead, and suggest the possibility of uraniu deposits nearby.

Chemical studies of the structure of serpentine-group minerals, th solubility of water in silicate melts at high temperatures and pressures and the role of sulfur in ore-forming processes, continue to provid data that help us interpret natural processes.

New analytical procedures and techniques provide faster and mo accurate chemical analyses for the large number of samples obtaine in all studies. Equipment has been designed and put in operatio that provides the analysis for as many as 22 elements simultaneousl and records the data in the same process. A new technique to provid spectroscopic analyses of samples weighing a milligram or less permi estimates of concentration of 68 elements.

*Geological Survey geologist quenches an experimental sulfide mineral bat for studies in environment of ore deposition.*

Geologic studies have helped select the sites for underground nuclear
est explosions, and have materially aided in studying the effects of
ch tests. Information derived from study of seismic waves from
e tests is being used in advancing our ability to detect clandestine
sts, as well as providing much information on deep crustal structures.
s a result of studies related to nuclear testing, the possible use of
nderground nuclear explosions to create artificial harbors is being
xplored.

## *oreign Geology*

Technical assistance to foreign governments is primarily intended
provide advisory services and help in training earth science
ecialists in the development of their economies through better
nderstanding of their natural resources. This assistance under the
uspices of the Agency for International Development included the
aining, advisory, and service functions of 56 Geologic Division sci-
tists working in cooperation with their host country counterparts in
2 nations, sharing advances in methods and techniques of geologic
esearch and investigations; and the training in this country of some
3 earth scientists and technicians from 22 countries.

During the year, the Brazilian iron project in the State of Minas
erais neared completion. This project during the past 15 years has
roduced geologic maps of about 7,000 square kilometers, and some
3 economic and scientific reports; 17 additional comprehensive reports
re nearing completion. Many Brazilian geologists have received
aining and contributed to the studies. The work has resulted in
e discovery of sufficient iron ore reserves to justify the establishment
nd continued life of a Brazilian iron industry.

In Bolivia, where cooperative work began only last year, two
olivian geologists using newly acquired techniques discovered two
re-bearing veins through geochemical prospecting methods and three
ther veins by electromagnetic surveys.

A geologic map of Libya was compiled to make information avail-
le for resource development. A geologic map of the Arabian Penin-
la was also completed. In Pakistan, a variety of mineral resources
ere investigated including glass sands, manganese, coal, and heavy
ineral placers; and in one study a deposit containing about a half
illion tons of barite was discovered.

In Thailand, where the mineral industry formerly included only tin
d tungsten, new diversified industries can now be based on manga-
ese, gypsum, ceramic clays, coal, and fluorite. In the Philippine
slands, commercial exploration was begun of chromite deposits that
ecame known as a result of Survey studies. More than 600,000 tons

*Geological Survey geophysicists searching in the field for buried ore bodi by means of the Slingram method. Electromagnetic waves, transmitted a battery-powered portable antenna coil, out of view to the right, are receiv by coil on the left; ratiometer and amplifier unit, shown on the right, cor pare the received signal with the transmitted signal, showing disturbanc of the electromagnetic field which could be caused by a buried, electrica conductive ore body.*

of refractory-grade chromite ores have been outlined by diamo drilling.

## *Conservation Division*

The principal tasks of the Survey's Conservation Division are classify Federal lands as to mineral and water resources and supervi mineral recovery under leases, permits, and licenses on Federal, I dian, and naval petroleum reserve lands. A headquarters staff a a field staff of geologists and engineers make surveys, maps, and ports dealing with water power, fuels, minerals, and chemicals essenti to the economy of the United States; supervise mining and drilli operations to assure safe and economical production by private ente prise of coal, oil, gas, and other minerals; and supervise operations the Federal Petroleum Board.

## *Mineral Classification*

During fiscal 1962, a total of 28,506 cases were processed by the urvey, including 3,700 cases involving the outright disposal of Fed-ral lands either with no reservation of minerals or with the reserva-ion of one or more specified minerals. There were 23,383 cases nvolving the exercise under Federal leasing laws of the Government's ight to lease a mineral substance to private enterprise.

Initial or revised definitions of 257 producing oil and gas fields were ade on or affecting Federal leaseholds; 111 reports were made on the ineral potentialities of certain lands for various agencies of the Fed-ral Government; and 594 reports were made to industry or indi-iduals in connection with activities on Federal lands involving unit lans, participating areas, productive limits, and associated matters. eologists from field offices throughout the West also made investiga-ions and produced reports and maps as needed in assisting engineers planning development and in administering Federal leases.

In the classification of the public lands, approximately 1,309 square iles were mapped geologically. Classification actions for approxi-ately 1,944 square miles in the coal fields of New Mexico, Montana, nd Colorado were completed.

The following maps or reports were completed during the year: preliminary structure contour map of the east side of southern an Joaquin Valley, Kern and Tulare Counties, Calif.; a contour map rawn on the Vedder Sand (Temblor Formation, Miocene) in the outhern part of San Joaquin Valley, Calif.; coal classification in the ampa Coal Field, Routt and Moffatt Counties, Colo.; a map of he Northeast Rangely coal area, Colorado; a subsurface study of he Paradox Basin, Utah and Colorado; a geologic map of Garns ountain SE quadrangle, Idaho; a structure contour map of the lue Buttes oilfield, North Dakota; a map showing the occurrence f coal in the Upper Cretaceous Mesaverde Group, Uinta Basin, tah; a cross section of the Kane Springs Wash anticline, Utah; a ubsurface study of Wasatch sands development in southeastern inta Basin, and a geologic map of the Paradise quadrangle, Utah.

Revisions of maps showing areas of prospective value for oil and as, for several states and maps for bitumens, coal, oil shale, phos-hate, and salines, were made.

Three bulletin chapters on geologic investigations of waterpower tes in Alaska were published.

## *Waterpower*

Investigations were continued to determine the potential of streams n the public lands for waterpower and conservation [illegible] water. The program is largely confined to the Western United States and Alaska where the bulk of the remaining public lands are located. Maps of 125 miles of stream valley and six dam sites were published. These included maps of Olive, Kunk, and Anita Lakes in Alaska and of portions of Kern River, Calif.; Lemhi River, Idaho; and Smith River, Oreg. Reports on the waterpower resources of southeastern Alaska, Bradley River, Alaska, and Wilson River, Oreg., were published as water supply papers. Four reports on the geology of waterpower sites in Alaska were published as bulletins of the Geological Survey. These maps and reports provide the basis for classification of the public lands as to their value for water resources development and provide invaluable information to possible developers of those resources.

The review of longstanding withdrawals of lands for waterpower and water storage purposes was continued. Four reports were completed in which power and storage values of 92,000 acres were reviewed. Of this area, 73,000 acres were recommended for restoration from withdrawal.

Work was started on a revision of estimates of the developed and undeveloped waterpower resources of the United States. Results will be published by the Geological Survey along with estimates o reserves of other energy producing resources.

Two hundred fifteen reports were prepared and submitted to the Department's Bureau of Land Management on the waterpower value of lands affected by applications for right-of-way easements and 3,700 reports were made on applications for land acquisition Twenty-eight waterpower reports were made on applications to the Federal Power Commission for restoration of lands in powersite withdrawals.

## *Mining*

Supervisory control is exercised by the Survey over mining activities concerned with prospecting, development, and production of minerals under permits and leases on public, Indian, and acquired lands

Permits and leases issued under applicable laws and regulations involve operations for coal, potassium, sodium, and phosphate on public lands and such metals and minerals as copper, iron, lead manganese, nickel, tungsten, uranium, vanadium, zinc, asbestos barite, bentonite, clay, coal, garnet, gypsum, feldspar, fluorspar limestone, mica, peat, phosphate, pumice, quartzite, quartz crystal sand and gravel, stone, and vermiculite on Indian and acquired lands.

Mining supervision includes responsibility for investigating and
eporting on applications for leases and prospecting permits; recom-
ending lease terms, enforcing compliance with lease terms and
egulations governing the conduct of prospecting, mining, and
illing operations; and determining royalty liability of lessees, main-
aining accounts, preparing statements and receiving payment of
oyalties and rentals.

As of June 30, 1962, there were under supervision 2,497 properties
nvolved in leases, permits, and licenses in 31 States of which 1,456
ere on public land, 276 on acquired land, and 765 on Indian land.
roduction from such lands during the fiscal year is estimated at
6,478,700 tons, valued at $163,108,000 with royalties amounting
o $8,024,400.

In order of magnitude of production, potash ranked first with
2,217,000 tons, valued at $74,122,500, followed by coal 5,869,800
ons, valued at $33,872,800; sand and gravel 3,456,500 tons, valued
t $2,356,100 and phosphate 1,969,500 tons, valued at $3,274,000.
ther production in substantial quantity includes uranium ore,
,302,700 tons, valued at $20,398,000; and sodium compounds,
,009,200 tons, valued at $25,068,000.

*exas Sulphur Co.—potash mine development on Colorado River at Kane
prings Wash, Utah.*

## *Oil and Gas*

Supervision of oil and gas activities includes operations for the discovery, development, and production of crude oil, natural gas and products extracted from natural gas, on Federal, Indian, and certain military and naval petroleum reserve lands.

Unitization activities of oil and gas operations involving public and acquired land were reflected in the approval of 85 new unit plans during the year and the termination of 72 that had been previously approved, leaving 453 approved plans covering 8,197,703 acres outstanding. About 60 percent of the petroleum, 44 percent of the natural gas, and 57 percent of the gasoline and liquefied petroleum gases obtained from public and acquired lands during the year were produced under approved unit agreements.

On the Outer Continental Shelf, one unit plan was approved and none were terminated during the year. The total now stands at 15, embracing 348,253 acres.

On Indian lands, 10 new units were approved and 2 were terminated, the total number of plans in effect at the end of the year being 84, involving 161,306 acres.

*Table showing supervised oil and gas activities, fiscal year 1962*

LEASES AND WELLS UNDER SUPERVISION

| Lands | Number of leases | Acres | Number of States | Wells studded | Wells completed | Completions productive [1] | Number of wells productive [1] | Total |
|---|---|---|---|---|---|---|---|---|
| Public | 133, 086 | 94, 521, 087 | 24 | 1, 971 | 2, 090 | 1, 322 | 20, 323 | 35, 20 |
| OCS | 868 | 3, 830, 879 | off 3 | 440 | 640 | 523 | 2, 757 | 3, 797 |
| Acquired | 6, 793 | 4, 734, 169 | 30 | 81 | 85 | 25 | 406 | 1, 07 |
| Indian | 11, 167 | 4, 105, 308 | 16 | 507 | 496 | 347 | 7, 063 | 11, 83 |
| Naval Petroleum Reserve No. 2 | 17 | 9, 226 | 1 | 64 | 47 | 45 | 370 | 78 |
| Military and miscellaneous | 21 | 17, 981 | 3 | 66 | 127 | 108 | 295 | 33 |
| Total | 151, 952 | 107, 218, 650 | -------- | 3, 129 | 3, 485 | 2, 370 | 31, 214 | 53, 03 |

PRODUCTION, VALUE, AND ROYALTY

[Estimated]

| Lands | Oil, barrels | Gas, 1,000 cubic feet | Gas, liquids, gallons | Value | Royalty |
|---|---|---|---|---|---|
| Public | 168, 173, 000 | 544, 816, 000 | 397, 335, 000 | $535, 084, 000 | $70, 038, 00 |
| OCS | 71, 227, 000 | 411, 702, 000 | 0 | 294, 806, 000 | 51, 609, 00 |
| Acquired | 5, 811, 000 | 22, 720, 000 | 2, 135. 000 | 21, 568, 000 | 2, 735, 00 |
| Indian | 44, 712, 000 | 103, 584, 000 | 134, 731, 000 | 138, 181, 000 | 18. 101, 00 |
| Naval Petroleum Reserve No. 2 | 4, 129, 000 | 6, 143, 000 | 13, 567, 000 | 14, 954, 000 | 2, 044, 00 |
| Military and miscellaneous | 2, 000, 000 | 471, 237, 000 | 41, 474, 000 | 15, 320, 000 | 2, 621, 00 |
| Total | 296, 052, 000 | 1, 560, 202, 000 | 589, 242, 000 | 1, 019, 913, 000 | 147, 148, 00 |

[1] Multiple completions (2 or more separately productive zones) are counted as separate wells.

NOTE.—Royalty figures do not include revenues from rentals and bonuses. Not included in the table but also under supervision, are 1 salt, 5 sulfur, and 6 phosphate leases in the OCS. The salt and sulfu leases yielded about $893,000 in royalties on production during the year

There were 154 drilling units, or communitization agreements, approved during the year and 3 terminated, making a total of 1,338 in effect as of June 30. Eight development contracts were approved during the year and four were terminated. A total of 21 such contracts were in effect on June 30 involving 8,212,988 acres.

### *Connally Act Administration*

The Connally Act of February 22, 1935, supports conservation activities of oil-producing States by prohibiting the interstate shipment of oil produced in violation of certain State oil and gas conservation laws. This act is administered by the Federal Petroleum Board at Kilgore, Tex., under supervision of the Geological Survey.

While the Connally Act is applicable wherever State laws limit the rate of production and prescribe conditions for producing and handling petroleum and its component parts, its chief application has been in the States of Texas, Louisiana, and New Mexico. The Board also enforces provisions of the act in Mississippi, Oklahoma, Arkansas, and Kansas. Violations of the Connally Act by producers outside designated areas have also been prosecuted and penalties imposed.

Unless exempted by the Board in writing and by notice, producers within designated areas are required to maintain and file correct and complete monthly and, as of January 15, 1962, semiannual reports. A separate report must be made by the operator for each pool or field.

At the beginning of the year, there were 15 cases of alleged violation of the act pending on the docket of the Board and 13 new cases were formalized during the year. Four cases, resulting in fines of $8,650, were settled. At the end of the year, 24 cases were on the Board's docket.

## *Water Resources Division*

The major objectives of this activity of the Geological Survey are to inventory the Nation's water resources and to make the information readily available in a useful form. The concept of a useful form changes apace with intensifying competition for water supplies, with increasing pollution of remaining supplies, and with growing awareness of conservation needs. Thermal pollution by industry, acid pollution from mining operations, flood plain zoning, and proper land use are modern problems which for their solution require water data, collected, analyzed, and presented in the comprehensive manner demanded by modern society.

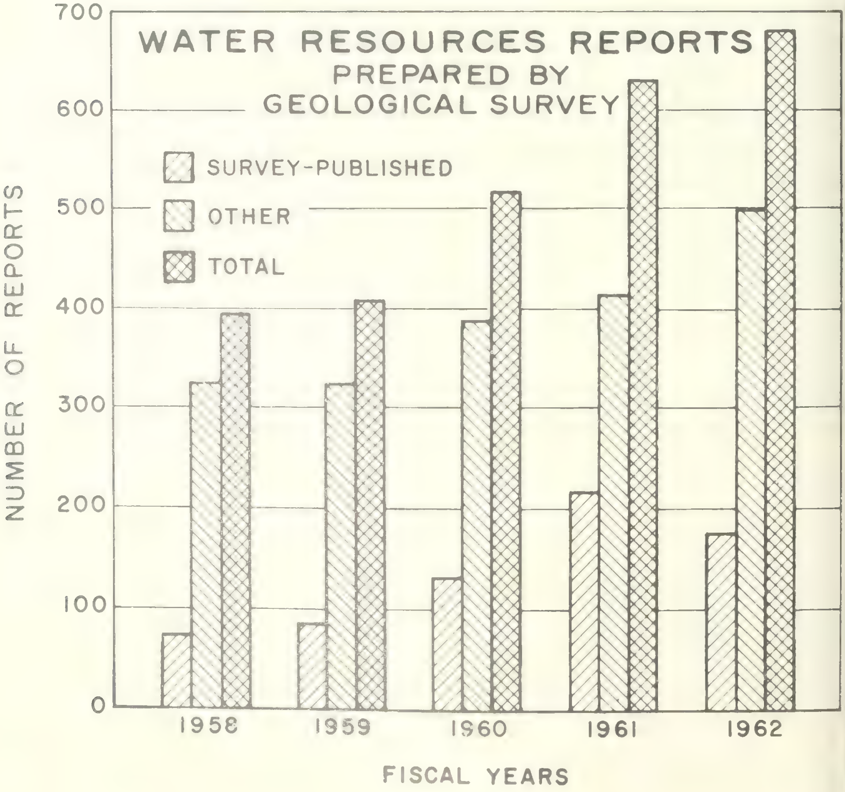
For man to maintain harmony with his water environment, he must know or learn the consequences of his activities and how to correct the imbalance which those activities impose on nature.

Interpretive studies and research are the new frontiers in water resources conservation. The breadth of knowledge necessary for the optimum planning of water projects comes only from properly interpreted basic data with research as the catalyst to convert water facts to water knowledge. As in other recent years, these objectives have provided the working philosophy of the Water Resources Division.

## *Water Resources Reports*

Greater emphasis in recent years on utilization of water data in interpretive studies and on research activities as a source of new knowledge and improved understanding of processes in the hydrologic cycle was reflected in the type of reports processed and published during the year. The publication of basic facts was a significant segment of the work but a somewhat smaller percent of the total effort than in the past.

Requests received for water information have shown that the general public is becoming more conscious of water and water problems. To



fill the need of a wide audience of informed laymen interested in water management, several reports were prepared in nontechnical language. These reports present complex concepts in a simple and easily understood way and supplement the more technical reports on hydrology, hydraulics, geochemistry of water, and other basic research.

Specific items of special interest were a report published on the use of water in the United States and a series of flood-inundation maps for the vicinity of Fremont, Calif., Harrisburg, Pa., Boulder, Colo., several areas in Ohio, vicinity of Chicago, Ill., and Atlantic City, N.J.

During fiscal 1962, the Survey prepared 107 water-supply papers, 17 circulars, 20 professional papers, 23 maps, and 3 bulletins concerning water. In addition, 73 reports were prepared for public reference and 425 reports were prepared for publication as cooperative State reports and as abstracts and articles in scientific journals.

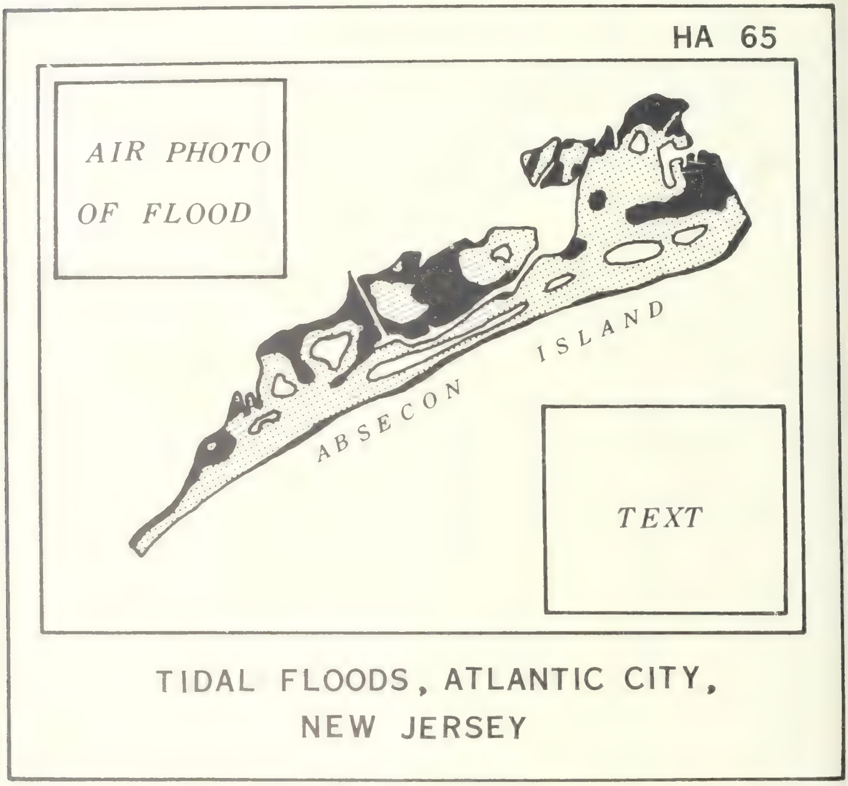
*State and municipal funds for cooperative water resources investigations*

| State | 1962 | State | 1962 |
|---|---|---|---|
| Alabama | 178, 810 | Nebraska | 128, 237 |
| Alaska | 13, 083 | Nevada | 103, 575 |
| American Samoa | 5, 750 | New Hampshire | 30, 235 |
| Arizona | 264, 917 | New Jersey | 248, 846 |
| Arkansas | 106, 428 | New Mexico | 237, 137 |
| California | 786, 794 | New York | 382, 456 |
| Colorado | 227, 400 | North Carolina | 325, 127 |
| Connecticut | 74, 634 | North Dakota | 103, 594 |
| Delaware | 55, 848 | Ohio | 180, 898 |
| District of Columbia | 3, 078 | Oklahoma | 115, 121 |
| Florida | 385, 381 | Oregon | 140, 009 |
| Georgia | 187, 936 | Pennsylvania | 290, 738 |
| Guam | 16, 000 | Puerto Rico | 100, 501 |
| Hawaii | 218, 417 | Rhode Island | 35, 287 |
| Idaho | 108, 668 | South Carolina | 46, 524 |
| Illinois | 143, 293 | South Dakota | 89, 640 |
| Indiana | 201, 163 | Tennessee | 105, 388 |
| Iowa | 164, 760 | Texas | 533, 627 |
| Kansas | 250, 865 | Utah | 228, 376 |
| Kentucky | 167, 096 | Vermont | 11, 504 |
| Louisiana | 291, 368 | Virgin Islands | 10, 000 |
| Maine | 29, 314 | Virginia | 59, 279 |
| Maryland | 88, 644 | Washington | 295, 689 |
| Massachusetts | 83, 748 | West Virginia | 48, 414 |
| Michigan | 157, 860 | Wisconsin | 101, 616 |
| Minnesota | 130, 428 | Wyoming | 125, 156 |
| Mississippi | 91, 255 |  |  |
| Missouri | 68, 158 | Total | 8, 656, 309 |
| Montana | 78, 239 |  |  |

## *Surface Water Investigations*

Streamflow and other surface-water data were obtained at 7,500 sites distributed throughout the 50 States, Guam, Samoa, and Puerto Rico. A special summary of streamflow records for the period 1888–1950 has been completed this year with publication of the report for Hawaii; summaries for all States have now been published. A similar summary for the period 1951–60 is currently in progress.

In its studies of floods, the Survey has prepared maps showing areas flooded in 8 cities in Colorado, Ohio, Pennsylvania and California, and has in various stages of completion flood-inundation maps of 25 other metropolitan areas throughout the Nation. Studies of the magnitude and frequency of floods, by river basin, were completed for four major areas and work was started in four others. Flood-volume studies were made for more than 3,000 streams and reports were prepared describing floodflow characteristics at 109 bridge sites.



*Sketch of a hydrologic atlas now in preparation. Map will show the areas flooded by the storm tides of September 1960 and March 1962 at Atlantic City and vicinity, New Jersey.*

Research projects of special note investigated the relationship of low streamflow to the geology of the stream basin, developed instrumentation to measure turbulence in flowing water, studied time of travel of major streams to provide information on dispersion of pollutants, and evaluated the regimen of small detention reservoirs.

*Aerial photo of the March 1962 floodtides at Ocean City, N.J. Hydrologic atlases for areas such as this are produced by the Survey, usually with Federal-State cooperative funds. The atlases are used for flood-mapping studies, engineering studies, et. {Photo furnished by the Philadelphia Evening Bulletin.}*

*A Geological Survey engineer uses a jeep-mounted crane with sounding weight and current meter to measure the flow of the Mississippi River a Vicksburg, Miss.*

## *Ground Water Investigations*

Ground-water studies are made to determine the source, movement and discharge of ground water and of variations in its quantity and quality from place to place, and from time to time. The ground-water program also includes fundamental and applied research t develop geologic and hydrologic principles and techniques. During the 1962 fiscal year, work progressed on about 450 ground-wate field projects and areal studies throughout the country. In additio to these, work also was conducted on 35 research projects.

Ground-water conditions were studied in areas ranging in siz from the large Mississippi embayment area, covering all or part o nine States, to the small Point Arguello, Calif., missile base site Desert valleys in Nevada were studied to provide the State with th information necessary to keep development consistent with availabl water.

Three of the 35 ground-water research projects are designed t increase the knowledge of the hydrology of different rock types

*A Geological Survey engineer determines the transmissibility of an aquifer in the Piedmont Province in Georgia by feeding water into a well at a constant rate and observing the change in water surface elevation.*

Studies of the hydrology of basalt are providing information on the availability of water in much of Oregon, Washington, and Idaho. A project on the hydrology of permafrost regions will provide information about the unusual and difficult problems of water supply in parts of Alaska. Studies of the hydrology of limestone areas will be applicable throughout many parts of the country. Other research projects are aimed at determining the physical laws governing movement of ground water in order to advance scientific knowledge of the water-bearing properties of rocks.

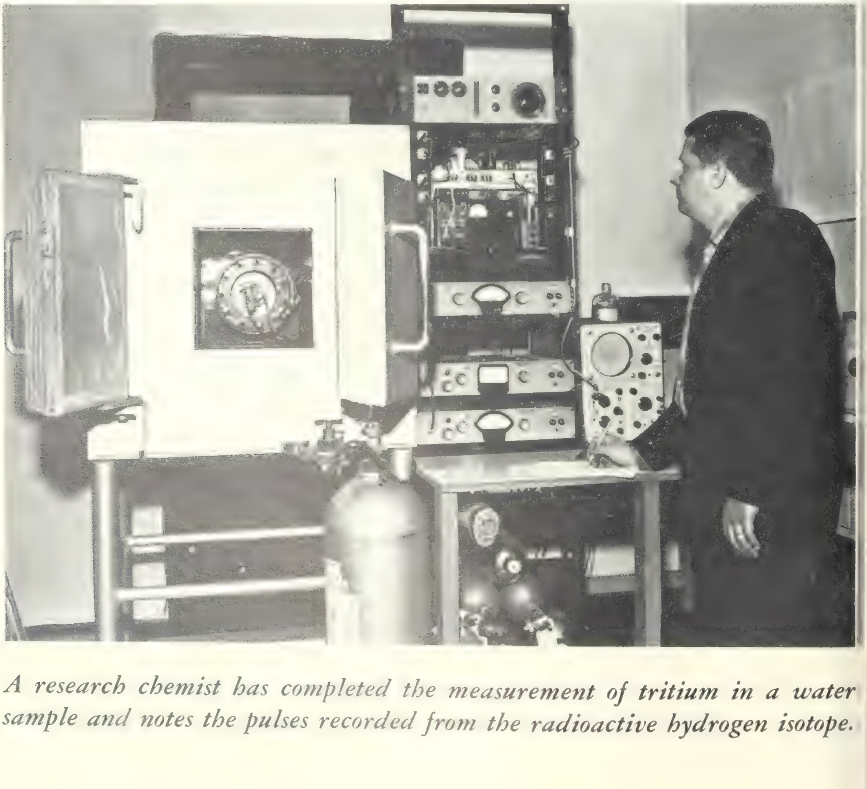
## *Quality of Water Investigations*

Water quality activities include basic and applied research, systematic collection, analysis and interpretation of chemical and physical characteristics of surface and ground waters, and the development of sampling, stream monitoring, and precision laboratory equipment not commercially available. Studies were made on a continuing basis in all major river basins throughout the conterminous United States, Alaska, and Puerto Rico, and the water quality of many smaller drainage areas is under investigation. Intensive studies of waterborne sediments continued in the Potomac, Missouri, Middle Rio Grande, and Colorado Basins.

During 1962, a national network of 1,956 water quality stations was maintained with support from Federal, State, and municipal agencies. An evaluation of the sediment trapped in small reservoirs continued, in cooperation with the Soil Conservation Service.

Current research is directed to removal of radionuclides from water by earth materials; chemical reactions of radioactive substances; water quality controlled by weathering of clay minerals; effects of biological factors on the quality of surface waters; behavior of detergents and other pollutants in soil-water environments; occurrence and distribution of the rare halogens such as iodine, bromine, and fluorine; chemistry of atmospheric precipitation, geochemistry of iron, manganese, and aluminum in natural water; occurrence and distribution of minor elements in fresh and saline waters; roughness in alluvial channels; distribution and concentration of radioactive waste in streams by fluvial sediments; techniques for utilization of sediment reconnaissance data; and measurement of coarse fluvial sediment.

Reports of special interest released in 1962 include quality of surface waters of the United States; some observations on the hydro-



*A research chemist has completed the measurement of tritium in a water sample and notes the pulses recorded from the radioactive hydrogen isotope.*

chemistry and sedimentation of the Chamberlain Glacier area, Alaska; effect of depth of flow on discharge of bed material; inventory of published and unpublished sediment-load data, United States and Puerto Rico; effect of bed roughness on depth-discharge relations in alluvial channels; and hydrologic influences of strip mining. Reports describing the quality of surface waters of Alabama, Arkansas, Kansas, New York, North Carolina, Oklahoma, South Carolina, and Texas were prepared in cooperation with those States.

## *Soil and Moisture Conservation*

Investigations to provide data for land conservation programs were continued in Nevada, New Mexico, Montana, Wyoming, and Utah. A project of intensive research on erosion was started in the basin of Warbonnet Creek near Harrison, Nebr. Included in this program is research on soil-plant-water relationships in arid environments.

***Investigating permeability of range soils and relationships between moisture runoff, infiltration, and use by natural vegetation near Fort Peck, Mont.***

## *General Hydrologic Investigations*

An investigation is underway in the "prairie pothole" region of North Dakota to determine the amount of water evaporated from the water surface and transpired by different types of vegetation

An investigation of the hydrologic effects of retarding reservoirs in the Sandstone Creek area of western Oklahoma was completed. Studies of stream morphology were conducted in environments ranging from the deserts of the Southwest to alpine areas of the Northwest.

The study of the use of water by saltcedar near Buckeye, Arizona, was continued in cooperation with the Department's Bureau of Reclamation. This project involves measurements of water used by the saltcedar growing in large tanks. A similar study on the use of water by willows, greasewood, rabbitbrush, and other local phreatophytes is being conducted in the Humboldt River Valley near Winnemucca, Nev. Several State and other Federal agencies are participating. A long-range, extensive study of water use by phreatophytes in the valley of the Gila River, Ariz., was started during the latter part of the year.

Geological Survey studies of South Cascade and Nisqually Glacier, Wash., are research efforts to gain additional insight into the relation of glaciers to climate. Data on hydrologic characteristics of glaciers are also being collected at Grinnel Glacier, Mont.

*A dense growth of saltcedar in the Gila River valley, Arizona. This worthless phreatophyte uses large amounts of ground water which might otherwise be available to more valuable vegetation or for other uses.*

*Glaciological studies by the Water Resources Division of the Geological Survey are largely concentrated at the small, highly instrumented South Cascade Glacier in the rugged Northern Cascade Range, Washington.*

Investigations at six established nuclear facilities were continued to determine the effect of disposal operations and to investigate techniques to decrease the possibility of adversely affecting water supplies. Investigations were continued at two existing and two planned sites for testing of nuclear explosives to determine effects of the testing on the hydrologic environment.

An adjunct to the disposal of radioactive wastes is the development of techniques for the use of radionuclides to implement hydrologic investigations. The Survey is investigating, for the Atomic Energy Commission, the use of radioisotopes as tracers to determine the paths, rate, and quantity of water movement in streams and aquifers in areas where specific refinement of hydrologic knowledge is needed.

### *Foreign Hydrology Program*

During the year, through the auspices of the Agency for International Development, 31 Geological Survey hydrologists worked overseas with 16 foreign governments. Survey hydrologists were assigned for short periods to Brazil, Egypt, Israel, Jordan, Nepal, and Panama to assist in the establishment of new or expanding water programs or to help in solving special problems. Long-term programs carried on in 14 countries included stream-gaging network programs in Afghanistan, Iran, Nepal and Turkey; hydrogeologic investigations in Chile, Egypt, Libya, Sudan, and Tunisia; hydrogeologic education in Brazil; and a water-management investigation in Pakistan with respect to waterlogging and salinity control in the Punjab region.

In the 16 host countires to which oversea Survey personnel were assigned, more than 200 nationals were given technical hydrologic training and guidance. In addition, 57 individuals from 24 foreign countries were given training in the U.S. field offices of the Water Resources Division.

## *Topographic Division*

The Survey's Topographic Division as its major function prepares and maintains the national map series covering the United States, its possessions and territories. This series is a fundamental part of the effort required to effectively inventory, develop, and manage the resources of the country.

Other functions are the production of related maps and other publications as necessary in the national interest; periodic revision and maintenance of all maps and publications; and the improvement of map products, operational techniques, and instrumental equipment through research and development. Information to Government agencies and the public concerning all available map products resulting from the surveying and mapping activities of the Federal agencies is furnished by the Map Information Office.

*Field surveying operations are expedited greatly by transporting engineers and equipment by helicopters over rugged terrain.*

## *Surveying and Map Preparation*

Of the total area of the 50 States, Puerto Rico, and Virgin Islands, 63 percent is covered by topographic surveys at scales of 1:24,000 and 1:62,500 (Alaska, 1:63,360). These surveys have been published as standard quadrangles for 55 percent of the total area. Advance copies, prior to map publication, of topographic surveys for the other 8 percent are available upon request.

During fiscal 1962, 468 maps of unmapped areas equivalent to 1.3 percent of the total area were published. Another 0.6 percent heretofore covered by 15-minute maps (1:62,500) at obsolete standards was replaced by 386 new maps at 7½-minute standards (1:24,000).

During the year, 59,300 square miles of 7½-minute mapping were added to the growing backlog of these maps which are 10 years old and which probably require revision. In 1962 the backlog of revision was diminished by 11,300 square miles; leaving 272,600 square miles of 7½-minute mapping requiring revision.

In addition, numerous special maps were published for various purposes such as research, administration, or information. In cooperation with the Department's National Park Service, cartographic compilation of shaded-relief maps were prepared for Lassen, Olympic, Rocky Mountain, Wind Cave, Yellowstone, and Yosemite National Parks.

One base map was completed for the State of Washington. Urban-area maps were completed for the metropolitan areas of Pittsburgh, Pa., and Milwaukee, Wis.

The following table is a detailed summary of map publication during fiscal 1962:

*Number of maps published during fiscal year 1962 and areas surveyed to produce these maps*

| | Area (sq. miles) | Number of maps | |
|---|---|---|---|
| | | 7½-minute | 15-minute |
| LARGE SCALE MAPS | | | |
| Standard quadrangle maps: | | | |
| New: | | | |
| Mapped at 1:24,000 scale standards | 31,006 | 345 | 56 |
| Mapped at 1:62,500 scale [1] | 14,419 | ---------- | 67 |
| Replacement of 1:62,500 maps by mapping at 1:24,000 standards | 22,232 | 383 | 3 |
| Revised | 12,542 | 203 | 5 |
| Reprinted without revision | ---------- | 273 | 300 |
| Special editions: | | | |
| Series conversion | 14,214 | 10 | 60 |
| Scale conversion | 13,314 | 184 | 15 |
| Total large-scale maps | 107,727 | 1,398 | 506 |

| | Number of maps |
|---|---|
| SMALL SCALE AND SPECIAL MAPS | |
| New maps: | |
| Urban area | 2 |
| National parks and monuments | 4 |
| 1:250,000 scale | 42 |
| Shaded relief | 15 |
| State base | 1 |
| Antarctica | 3 |
| Map revision: | |
| 1:250,000 scale | 13 |
| Topographic indexes | 86 |
| Reprinted | 126 |
| National park and monuments | 1 |
| Total small-scale and special maps | 293 |
| Total maps | 2,197 |

[1] Includes 1:63,360 mapping, Alaska only.

## *National Atlas Project*

During this year, the Geological Survey began the planning of a national atlas. The atlas will be a compilation of maps useful to Government agencies and officials, business and industrial establishments, educational institutions, and libraries; and will not compete with standard, largely geographic atlases and map collections issued by commercial publishers.

In general, 150 or more subjects to be included in the national atlas will fall into four categories: (1) Introductory material; (2) physical maps; (3) economic maps; and (4) cultural maps. Production of the atlas will start in fiscal 1963.

### *Training Program*

The Geological Survey, in cooperation with the Agency for International Development (AID), extends technical assistance to many nations. During fiscal 1962, technical training was provided by the Topographic Division to representatives from Brazil, Chile, Colombia, El Salvador, Egypt, Indonesia, Ethiopia, Pakistan, Philippines, and Sudan. Two technical experts are being furnished to AID for extended periods in connection with the mineral exploration program in Pakistan.

### *Antarctica Mapping*

Topographic mapping in Antarctica was conducted as part of the U.S. Antarctic research program of the National Science Foundation. During the 1961–62 austral summer, six engineers were assigned to the Antarctic area to establish geodetic control for mapping, using methods that combine triangulation with solar and daylight stellar observations. Electronic distance-measuring equipment was used by

*Aerial view of a tent camp on the Ross Ice Shelf, used by Survey engineers engaged in mapping operations in Antarctica.*

a three-man helicopter-supported party to establish geodetic control on 100,000 square miles of mountainous terrain.

Stellar observations for geodetic position were made at the marker designating the South Geographic Pole, and at the new Byrd Station.

About 105,000 square miles of aerial photography were obtained by U.S. Navy Air Development Squadron Six (VX–6). A Survey photoliaison technician was assigned in an advisory capacity to the Squadron's photographic laboratory in Christchurch, New Zealand to insure that mapping-quality photography was obtained. Topographic maps in shaded-relief editions were published of the coast of Wilkes Land and of the Sentinel Range of the Ellsworth Mountains Mapping is in progress for the Horlick Mountains, Executive Committee Range, McMurdo area, Britannia Range, Queen Alexandra Range, the Heritage Range of the Ellsworth Mountains, and of part of the Pensacola Mountains. The Geological Survey continued to serve as the U.S. Antarctic Map and Aerial Photography Library and provided consultant services to scientific and technical visitors.

## *Research and Development*

All major phases in the preparation of topographic quadrangle maps benefited by research and development in the Topographic Division during 1962.

To provide guidance for this research effort and to evaluate procedures, standards, and instruments, the Division carries on an accuracy testing program. In this program a representative 10 percent of the quadrangles are tested by special surveys for both position and elevation accuracy. The tests are designed to give results that can be subjected to statistical analysis. The evaluated test findings are an important aid in selecting optimum methods for new mapping, in designing research in operations, and in formulating standard procedures.

Long-range research has been devoted to improving the basic information content of topographic maps by addition of photoimagery and to producing map supplements or map substitutes based on orthophotography in various forms.

*Truck-mounted surveying tower.*—Lightweight, portable towers for control surveys designed by engineers of the Topographic Division are triangular in cross section, and weigh approximately 5 pounds pe foot of height. The height may be varied from 14 to 74 feet in 6-foo increments. Each unit consists of an outer tower to support the observer, and an independent inner tower to support a surveying instrument. The towers can be transported assembled as a trailer In recent experience, for reconnaissance, 36- and 50-foot towers have been mounted on pickup trucks. Truck-mounted towers, with outriggers and a winch, can be erected by one man in less than 15 minutes, saving considerable field time in selecting station sites.

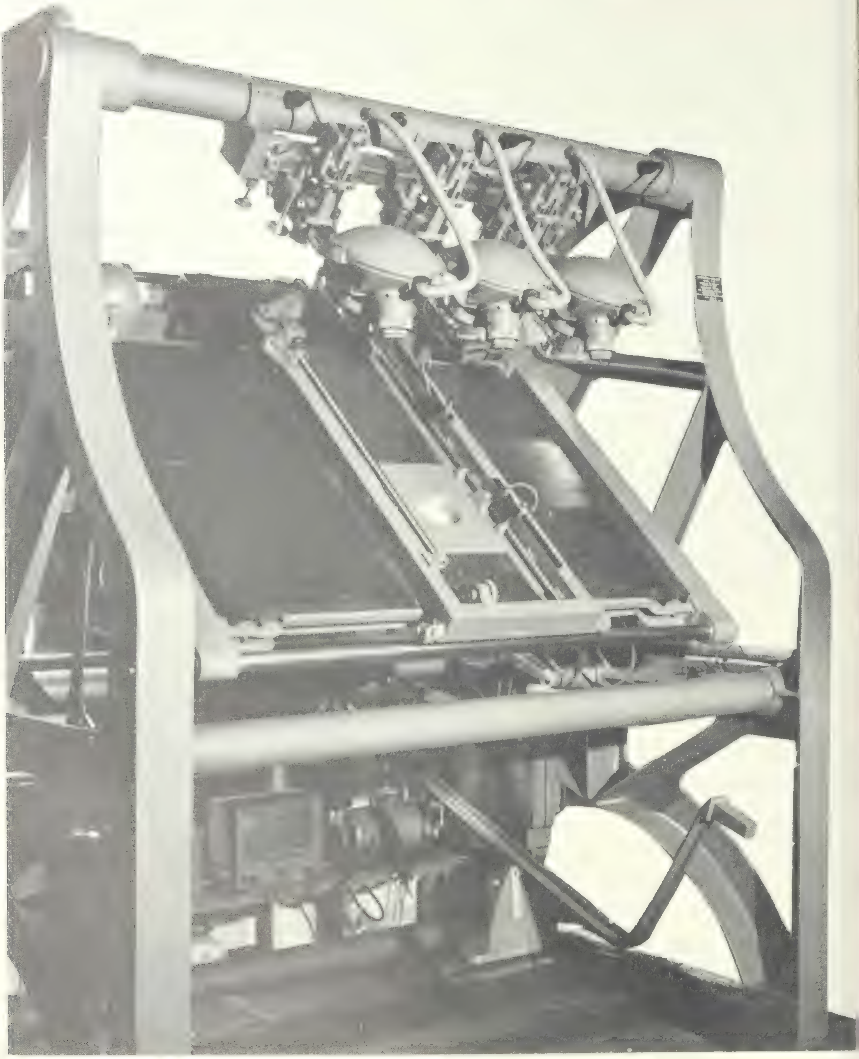
*Position from star observation in Antarctica.*—During the summer of 1961 studies were undertaken to improve star observing techniques and to evaluate the azimuth method of geographic position determination. The method appeared applicable to determining positions in Antarctica where previous positions based on altitude measurements of the sun were influenced by the effects of uncertain variable refraction. During the 1961–62 season, daylight star astronomic observations based on both azimuth and vertical angle measurements were made at eight Antarctic stations. In addition to providing data on the effect of vertical refraction, it may be possible to use the separate solutions to evaluate the relative merits of the altitude or azimuth methods.

*Visual fatigue in photogrammetric operations.*—A pilot study of the visual problems of 10 selected stereocompilers, conducted in the Rocky Mountain area office in 1958–59, showed that visual refractive corrections and improved ambient illumination conditions resulted in generally improved operator efficiency. A second project involving 60 Rocky Mountain area stereocompilers is in progress.

*Map-photograph combination.*—For some purposes aerial photographs are superior to maps because of the wealth of fine detail they contain. But they have two disadvantages—their scale is not uniform, so they cannot be used directly for measuring distances and areas, and the large amount of detail shown by fine tonal graduations makes them difficult to interpret. An ideal product would be a combination map and photograph, which would have reliable scale and readability of a map, and the complete detail of the aerial photograph. Research in the Topographic Division extending over several years holds promise for the economical production of such a combination.

The production of uniform-scale photographs (orthophotographs) is now practical by means of the orthophotoscope. The model T–61 orthophotoscope, the third of a series of such instruments, was completed in prototype form in 1961. It produces satisfactory orthophotographs from most mapping photography. Operation testing and design refinement of the T–61 are now underway. Studies are in progress on scribing on orthophotographs, and on various techniques for processing orthophotographs to produce map substitutes.

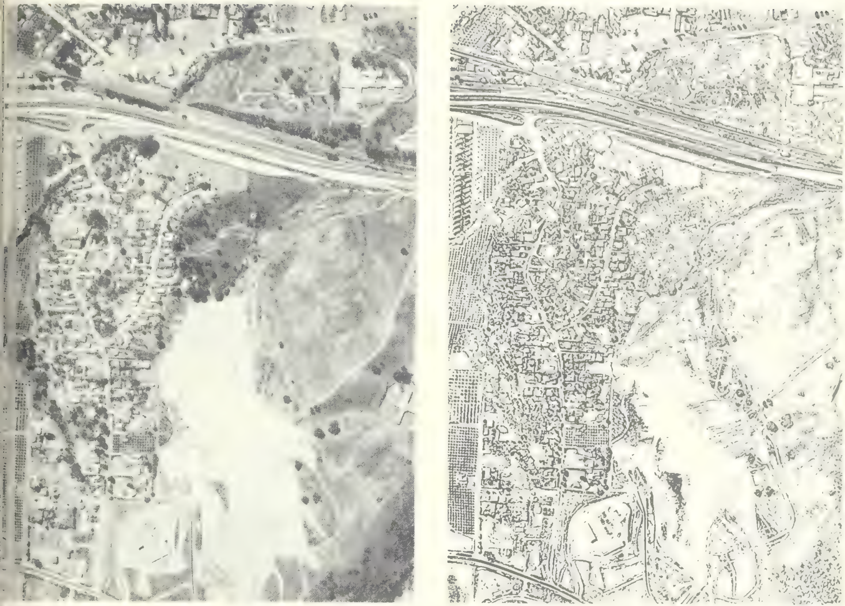
As a means of improving the legibility of aerial photographs, a photolaboratory technique has been developed called edge isolation. In this procedure a film positive or print is produced that has extremely opaque image edges, with other tonal graduations suppressed. The edge-isolated print is made by a semiautomatic two-step process using the infrared quenching action of a photographic contact printer.



*Orthophotoscope Model T–61*

When the original is an orthophotograph, the edge-isolated prin shows buildings, roads, woodland, and other features by line image in true position. Patterns useful to geologists and photointerpreter are often more easily identified than on a continuous-tone print.

The combination of orthophotography and edge isolation may lea to economical production of a new type of map or map substitute.



*Comparison of normal and edge-isolated aerial photograph. In the print at the right, buildings, roads, trees, and other features are shown as line images instead of continuous tones. This photographic technique is a means of producing quickly a useful map substitute.*

## *Map Information Office*

Facilities for supplying information on maps, aerial photography, and geodetic control surveys to Federal, State, and local government agencies and to the public are maintained at the Map Information Office in Washington and at the Division's area offices. Services include over-the-counter map sales for the convenience of the public, commercial firms, and Government agencies; sales of prints of advance materials from current topographic mapping and photostats of out-of-print maps; graphic or tabular assemblies of map, photographic, and geodetic control information.

The 10th edition of the index map, "Status of Topographic Mapping in the United States," was published in two sheets. The new edition shows by color pattern the scale and evaluation of the topographic maps available for the States, Puerto Rico, and the Virgin Islands, and delineates the areas in which new mapping is in progress.

Material was assembled for the 12th edition of the index map, "Status of Aerial Photography," and the 8th edition of the index map, "Status of Aerial Mosaics." The new editions will show all areas known to have been photographed and those for which aerial mosaics or photomaps are known to have been compiled by Federal State, and commercial agencies.

A supplement to the aerial photography index map for the calendar year 1961 was prepared for administrative use. This index ma shows areas for which photography was contracted or delivere during the year.

Twenty-three sheets in the 1:250,000-scale series of geodetic control diagrams were published in cooperation with the Coast an Geodetic Survey. These diagrams show the location of horizonta and vertical control surveys and provide information essential t planning topographic mapping projects, to engineers establishin electronic transmission facilities, to land surveyors making connection to the Federal net, and to those engaged in scientific investigations

During the year, many inquiries pertaining to maps showing Civi War battlefields were received. In order to service these requests as well as to make such information readily available, a bibliograph of Government maps and charts covering areas in which the majo battles of the Civil War took place was published as Circular 462

## *Publications*

The results of research and investigations by Geological Surve scientists and engineers, both in the field and in the laboratory, ar made available to the public through a variety of reports and maps Of the formal reports published by the Survey, books are printed b the Government Printing Office and maps are printed in the Survey own plant.

During the past fiscal year, 216 technical book reports were published. Printed maps totaled 2,810, of which 1,950 were new an 860 were reprints. The 2,810 maps comprised nearly 7,980,00 copies that ranged in size from 17 by 21 inches to 50 by 72 inche

| Kind of maps | Number of maps printed |
|---|---|
| Topographic maps: | |
| Standard | 2,1 |
| Other [1] | |
| Geologic maps: | |
| Geologic quadrangles and miscellaneous investigations | |
| Mineral resources | |
| Geophysical investigations | |
| Conservation maps: River surveys | |
| Water resources maps: Hydrologic atlases | |
| Maps for inclusion in book reports | 2 |
| Maps for other agencies | 1 |
| Total | 2,8 |

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[1] Includes experimental printings and other miscellaneous maps.

Geological Survey maps are distributed by mail from bulk stocks at Silver Spring, Md., Denver, Colo., and Fairbanks, Alaska. Over-the-counter map sales are made at these and 13 other Survey offices. In addition, 561 commercial agents throughout the United States sell these maps to the public.

In addition to approximately 43,500,000 maps, books, and pamphlets on hand at the beginning of the year, 7,266,000 copies were received of new and reprinted maps, as well as 382,000 copies of reports. Distribution of 4,691,000 copies of maps was a substantial increase over last year's comparable figure of 4,544,000. Approximately 307,000 book reports and pamphlets, 139,000 copies of the Survey's monthly announcement of new publications, and 245,000 topographic map descriptive folders and symbol sheets also were distributed during the fiscal year.

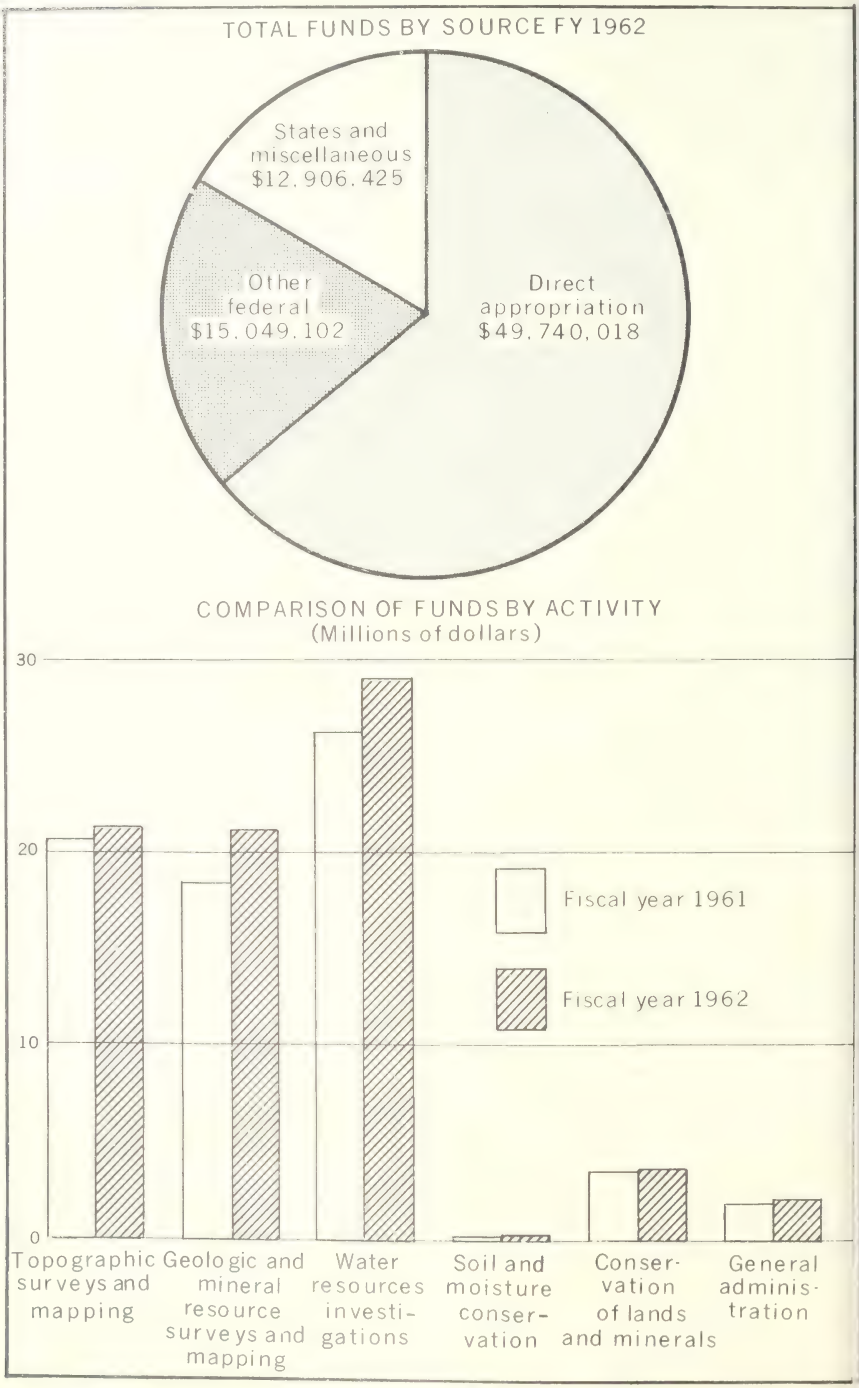
The total distribution was implemented by 250,000 individual orders. Sale of maps to the public brought in $688,569.87, which was deposited to miscellaneous receipts in the U.S. Treasury. All the book reports distributed by the Survey and 24 percent of all maps were provided free for official and educational use. General distribution of Survey book reports to the public is through sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

The number of publications distributed by the Geological Survey during fiscal 1962 as compared to last year is shown in the following table:

| | Maps, map indexes, and book reports | | Increase or decrease (percent) |
|---|---|---|---|
| | Fiscal year 1961[1] | Fiscal year 1962 | |
| Washington | 2,578,100 | 2,864,350 | +11 |
| Denver | 1,854,800 | 1,675,750 | −10 |
| Fairbanks | 45,200 | 43,050 | −5 |
| Other offices | 368,200 | 415,350 | +13 |
| Total | 4,846,300 | 4,998,500 | +3 |

[1] Quantities revised downward, by exclusion of symbol sheets and descriptive folders, for comparison with new reporting procedure.

During fiscal year 1962 the Geological Survey incurred obligations otaling $77,695,545. The following charts illustrate the total unds by source and budget activity.


TOTAL FUNDS BY SOURCE FY 1962
States and miscellaneous $12,906,425
Other federal $15,049,102
Direct appropriation $49,740,018
COMPARISON OF FUNDS BY ACTIVITY
(Millions of dollars)
30
20
10
0
Fiscal year 1961
Fiscal year 1962
Topographic surveys and mapping
Geologic and mineral resource surveys and mapping
Water resources investigations
Soil and moisture conservation
Conservation of lands and minerals
General administration

# Bureau of Mines

## Marling J. Ankeny, *Director*

American technology advanced rapidly on many different fronts during the 12 months comprising the 1962 fiscal year. This swift progress frequently emphasized past accomplishments of the Department of the Interior's Bureau of Mines and, just as frequently, established new and challenging future goals for the Bureau's scientists and engineers.

Titanium metal and helium, both available today as a result of Bureau efforts, played essential parts in the Nation's space achievements. Progress was made in research to improve the mining, processing, and utilization of coal. Iron- and steel-making technology was advanced. New gains were made in Bureau programs to develop methods for producing high-purity metals, and substantial additions were made to scientific knowledge about the fundamental properties of many different minerals and fuels.

However, even as methods and materials were being developed in Bureau laboratories to meet present needs, innovations in engineering technology created demands not only for more of the mineral products that already are available but for materials to satisfy exacting specifications and to meet requirements that did not exist a short time ago.

As the year ended, it was clear that conservation and development of America's mineral resources, and those of the free world, is a task more difficult, more challenging, and more vitally important than it has ever been.

## Helium

Large-scale conservation of the Nation's irreplaceable helium resources moved closer to reality with the award of long-term helium purchase contracts to four private companies.

Under these contracts, the companies are to finance and build, and will operate, five plants to recover helium from certain natural gase serving fuel markets. During the 22-year life of the purchase agreements, about 62.5 billion feet of helium will be purchased by the Government and stored underground until needed in the future o sold by the Bureau of Mines to meet current demands. In this way waste of a limited and irreplaceable resource willl be reduced, an helium will continue to be made available for important uses in man areas of science and industry.

Award of the four contracts utilized all of the $47.5 million-a-yea contracting authority granted by the Congress for the program Additional details about the four contracts are shown in the tabl that follows.

*Summary of Bureau of Mines contracts with private companies for the acquisitio of helium for conservation*

| Company (and parent companies when applicable) | Plant location and date of contract | Initial unit price (for 1,000 cubic feet) | Maximum annual obligation (millions) | Estimated helium volume (million cubic feet) | |
|---|---|---|---|---|---|
| | | | | Annual average | Life of contract |
| Helex Co. (Northern Natural Gas Co.) | Bushton, Kans., Aug. 15, 1961. | $11.24 | $9.5 | 675 | 13,50 |
| Cities Service Helex, Inc. (Cities Service Co.). | Ulysses, Kans., Aug. 22, 1961. | 11.78 | 9.1 | 610 | 12,20 |
| National Helium Corp. (Panhandle Eastern Pipe Line Co. and National Distillers and Chemical Corp.). | Liberal, Kans., Oct. 13, 1961. | 11.78 | 15.2 | 1,053 | 21,06 |
| Phillips Petroleum Co | Sherman County and Dumas, Tex., Nov. 13, 1961. | 10.30 | 13.7 | 788 | 15,76 |
| Weighted average or total | | 11.29 | 47.5 | 3,126 | 62,52 |

Construction of the main section of a 427-mile pipeline system t transport crude helium (a mixture of about 60 percent helium an 40 percent nitrogen) from industry's plants to the Government' Cliffside field near Amarillo, Tex., was 90 percent complete on Jun 30, 1962. The pipeline system, costing about $8.5 million, will b operated by the Bureau.

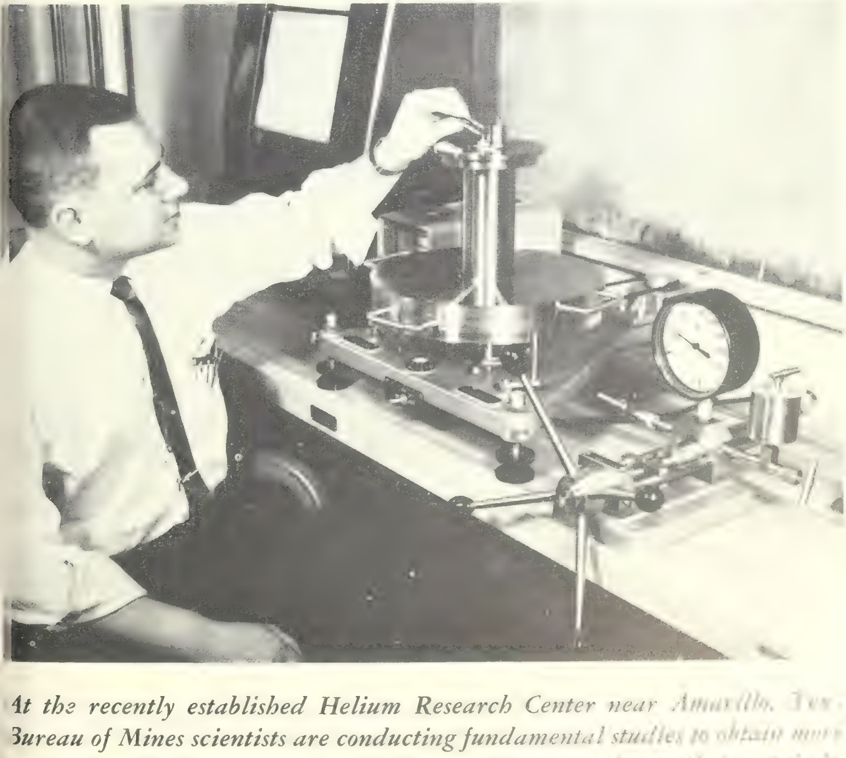
The helium conservation program is required by the Helium Ac of 1960 to be self-liquidating, and to meet this requirement, the pric of helium sold by the Bureau of Mines was increased to $35 a thousan cubic feet f.o.b. Bureau plants. Even so, expenditures will excee income from sales during the early years of the program. Additiona funds are to be obtained as necessary, through borrowing as authorized by the Congress. Borrowing of $10 million was authorize without fiscal year limitation but was not used in 1962 because non of the new plants were completed and no helium was purchased

Additional borrowing authority will be included in future budget equests.

In response to continued increases in helium demand during fiscal 1962, the Bureau of Mines shipped 588 million cubic feet of the ightweight element; about 76 percent of this went to Federal agencies. Production of helium at the five plants operated by the Bureau exceeded demand by nearly 147 million cubic feet. The excess was stored underground for future use, increasing the total in underground storage to 566 million cubic feet.

A helium plant with a capacity of 65 million cubic feet a year, built by Kerr-McGee Oil Industries, Inc., of Oklahoma City, Okla., began producing and marketing helium from the Pinta Dome field in eastern Arizona during November 1961. This operation, not a part of the Government helium conservation program, is the first private venture into helium production since the 1930's.

Helium continued to play important roles in rocket, missile, and space programs, nuclear reactor development, shielded-arc welding, metallurgy, low-temperature research, and medical and scientific studies.



*At the recently established Helium Research Center near Amarillo, Tex., Bureau of Mines scientists are conducting fundamental studies to obtain more knowledge about the properties of helium and the natural gases that contain it.*

A helium research program was conducted as an integral part c the helium conservation program at the recently established Heliu Research Center in Amarillo, Tex. Besides conducting studies t develop and improve techniques for extracting and saving heliun scientists at the center perform fundamental investigations to lear more about the properties and uses of this remarkable element. Suc research helps assure that the conserved helium will be used wisel and effectively to further scientific progress and to advance the nation economy.

# *Petroleum, Natural Gas, and Oil Shale*

Development and efficient use of the Nation's petroleum an natural gas resources were promoted through many Bureau of Min scientific, engineering, and factfinding programs in fiscal 196 Research to increase technical information on oil shale was als conducted to assure a firm basis for commercial development whe this resource is needed.

New information on detrimental substances in petroleum w gained when 12 additional sulfur compounds were identified in Wasso Tex., crude oil and 8 in Wilmington, Calif., crude oil. Some 94 suc identifications have now been made. Sulfur-concentrate fractio were prepared from a sample of "deasphaltened" Wasson crude c residue, providing six samples for further study. All will be screene by the National Institutes of Health for possible cancer-causi characteristics.

Improvements during the year in a Bureau catalytic microhydr genation technique—developed for analyzing trace components petroleum—advanced the sulfur project alone by at least 2 yea beyond the stage that would have been possible with older method Other advances in analysis included improved chromatograph techniques that make it easier to separate sulfur compounds fro various mixtures. About 45 sulfur-containing compounds we synthesized during the year, and one standard sample was purifie bringing the total number of standards to 42. A low-temperatu zone-melting unit capable of performing at −100° C extend considerably the operating versatility of the purification techniqu

## *Nitrogen Compounds Identified*

A special distilling process was used in laboratory research c separating and identifying harmful nitrogen compounds that prese a major problem in utilization of low-grade crude oils.

Fundamental studies with a constant-volume combustion bomb ielded data on ignition delays for eight normal paraffins and eight iefins. Good correlations were obtained in several different treat- ients of the data, suggesting a close relation to physical laws overning combustion processes.

Petroleum-product survey reports again provided semiannual data n motor gasolines and annual data on aviation, diesel, and burner iels marketed in the United States. Obtained by the Bureau rough industry's cooperation, this information guides the petroleum idustry in planning its refining operations, aids the automotive idustry and manufacturers of burner equipment in design problems, nd assists consumers in selecting and using petroleum fuels.

## hlorinated Petrochemicals Studied

During the year, basic studies in thermodynamics yielded new ata used in research and for designing and developing industrial ocesses. Chlorinated petrochemicals were studied with the Bureau's ethod of rotating-bomb calorimetry to provide data for civilian and efense applications. A modified combustion bomb featuring ntalum linings and fittings was perfected. Platinum lining— dinarily used when the combustion reaction has corrosive products not suitable for certain compounds because surface catalysis leads unwanted side reactions.

Use of sodium tripolyphosphate (STP) to aid oil recovery by increas- g injection rates in waterfloods continued to grow during the year. wo papers describing the Bureau's development and use of this aterial were published. Several major phosphate-producing com- nies now perform their own field tests with this chemical. One m initiated a large-scale marketing program—using nationwide lvertising and special packaging of STP for the petroleum industry— at acknowledged the Bureau's research.

Calculations and predictions concerning various other secondary- covery methods were made, and three articles on Appalachian gion oilfield reservoirs were published. This information assisted stern oil operators, especially in the Pennsylvania Grade crude-oil ea, to establish additional secondary-recovery projects and thus crease total recovery of the area's high-quality crude oil.

## omputers Aided Oil Conservation

Computer methods for forecasting future performance of complex troleum reservoirs were published as an aid in conserving oil serves. These reports are concerned with unsteady state and o- or three-phase flow in reservoirs in complex geometry.

Extensive laboratory permeability tests with water-plugge sandstone cores showed that water blocks in gas wells can be remove efficiently with detergent solutions in isopropyl alcohol. A field tes of the alcohol-surfactant method of removing water blocks demonstrated the applicability of the treatment by causing an increase i the gas produced from a 12,000-foot well in Pecos County, Tex.

*Different components of shale oil are separated from one another in th apparatus at a Bureau of Mines research center.*

A comprehensive study was begun of the magnitude of chemical wastes and oilfield brines, and of methods used to dispose of them by njection into permeable formations. Complete geologic and engineerng data were obtained on 16 chemical-disposal operations, principally n the South-Central, Southwest, and Gulf States, and in Michigan.

An analytical method for studying thermal degradation of oil shale, developed by the Bureau, and described in one of its publications during the year, permits accurate determination of the distribution of organic elements in thermal-degradation products, facilitating characterization of different oil shales. A ~~total of~~ 51 sample sets providing comprehensive sampling of oil-shale deposits at specific locations was obtained from private companies and from Government agencies during the year. These samples, representing shales mostly of the Green River formation in Colorado, Utah, and Wyoming, will provide much new knowledge about the oil-shale resources of this country.

The Bureau continued to provide the Oil Import Administration with reliable petroleum statistics to help it formulate policy and administer controls. Bureau forecasts, one prepared annually and two twice yearly, were used to determine crude and product import quotas. In all, 120 statistical reports on petroleum and natural gas were published during the year.

## *Minerals Development*

Improved techniques for processing and utilizing the Nation's extensive low-grade iron ore resources, greatly expanded mining research, and a continued search for better metals, alloys, and compounds for use in missiles and space exploration highlighted Bureau programs for metallic and nonmetallic minerals in fiscal year 1962.

A high-intensity gamma-irradiation (cobalt 60) facility, the largest of its kind for mineral studies in the United States, was built and placed in operation during the year at the Albany, Oreg., Metallurgy Research Center.

### *New Pellets for Blast Furnace Made From Low-Grade Ores*

Outstanding success was achieved toward the end of the fiscal year in one phase of the Bureau's iron ore program when a new blastfurnace feed, prepared with techniques developed at the Bureau's Minneapolis, Minn., Research Center and averaging about 80 percent iron, was tested in the experimental blast furnace at Bruceton, Pa. Made from Lake Superior taconite and prereduced with North Dakota lignite, the pelletized feed made possible the highest produc-

*A technician operates the controls of a master-slave manipulator in the Bure of Mines new cobalt 60 radiation cell. This unit, activated during the yea will be used in studies to determine the effect of radiation in improvi minerals and fuels technology.*

tivity and lowest fuel-consumption rates ever recorded in operati the experimental furnace. The methods used in preparing t pellets may ultimately contribute to economic processing of t Nation's vast reserves of nonmagnetic taconite.

An earlier achievement, pioneering injection of supplementa fuels into blast furnaces, received industrywide recognition wh

Bureau scientists were awarded a certificate of special merit by the American Iron and Steel Institute.

In addition to its use for comparing and evaluating raw materials, the Bruceton furnace was used extensively in developing new and more efficient operating procedures. Theoretical studies of the blast furnace continued as preliminary calculations were completed on an analog-computer simulation of its operation.

## Iron Ore Flotation Method Improved

The flotation method developed earlier for concentrating nonmagnetic taconites and semitaconites was improved. In the Bureau procedure the silica gangue material is floated away from the iron minerals. In another technique investigated during the year, the nonmagnetic iron minerals were converted, through reductive roasting, to magnetic minerals and then concentrated magnetically.

Continuing investigations into the physical chemistry of steelmaking included work on high-temperature reactions, depleted uranium as an alloying element in steel, use of gaseous oxygen for the partial refining of molten pig iron, addition of rare earths to improve the high-temperature properties of alloy steels, and effectiveness of radioisotopes for identifying phases in steel.

## Hot-Twist Steel Test Published

Evaluation of hot-working characteristics of steel by novel "hot-twist" testing techniques was described in one Bureau report, while another described the use of titanium as a substitute for manganese in steel. In addition, comprehensive materials surveys were published on cobalt, kyanite, lithium, and vanadium.

Relationships between damping capacity (internal friction that slows vibrations), internal structure, and magnetic and physical properties were determined and published for high-damping manganese-copper alloys containing from 60 to 85 percent manganese. These investigations continued to stimulate interest in industry and among physicists concerned with problems of vibration in metals.

In an experimental 20-inch-diameter shaft furnace, manganese minerals from a Minnesota brown ore were converted to water-soluble sulfate. A patent was issued for the rotary leaching drum used to extract the manganese salt. Feasibility of the inverse solubility method for recovering manganese sulfate from solutions was demonstrated, suggesting the possibility of lower costs and better operating procedures than those anticipated for evaporation methods.

## Basic Information Obtained on Tungsten and Chromium

Tungsten and chromium research in fiscal 1962 was concerned mainly with developing fundamental scientific data, improving processing techniques, and broadening the utilization of low-grade ores. The Bureau's basic studies in vapor deposition of tungsten led more than 20 industrial firms to engage actively during the year in developing applications for the vapor-deposition process. Some high-temperature applications of tungsten metal and alloy were studied intensively to form a basis for systematically exploiting their usefulness in modern metallurgy.

Initial success with fluidized-bed techniques for coating smal particles of refractory oxides with tungsten may ultimately provide new materials for use at elevated temperatures. Improved techniques were sought for preparing tungsten metals and compounds and for producing ultrapure tungsten and chromium metals. Promising methods for using domestic low-grade ores of tungsten were pursued while successful tests indicated the technical feasibility of using domestic chromite resources to produce ferrochrome.

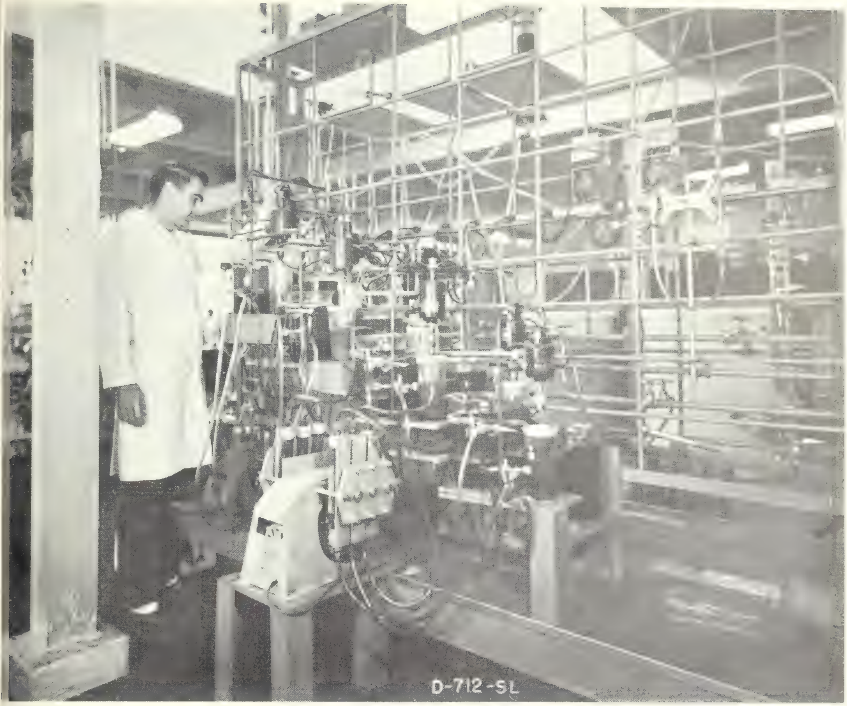
Reliable analytical methods for determining minute constituent of high-purity metals and compounds were developed, and procedure utilizing complex, modern analytical instruments were described by the Bureau. The effectiveness of the electron-probe X-ray spectrograph was increased by installing vacuum spectrometers that extended its measurement range. Small concentrations of aluminum, phosphorus, and calcium in various materials were determined.

Bureau laboratory research was successful in developing technique for producing high-purity ductile molybdenum metal, and Bureau chemists developed an X-ray fluorescence method for analyzing tungsten and molybdenum metals and electrolytes.

## High-Purity Nickel Produced

Commercial-size electrolytic starting sheets of extremely pur nickel were produced from crude nickel with a Bureau-developed electrolytic-solvent-extraction process. The sheets contained les than 2 parts per million of cobalt, a much lower value than any electrolytic nickel available commercially.

High-purity vanadium metal also was obtained, utilizing bomb reduction and electrorefining techniques. A method developed earlie for reducing vanadium metal from vanadium pentoxide in an ope vessel was successfully scaled up to produce 15-pound ingots, an vanadium-titanium and vanadium-aluminum-titanium alloys wer made by continuous open-vessel reduction.

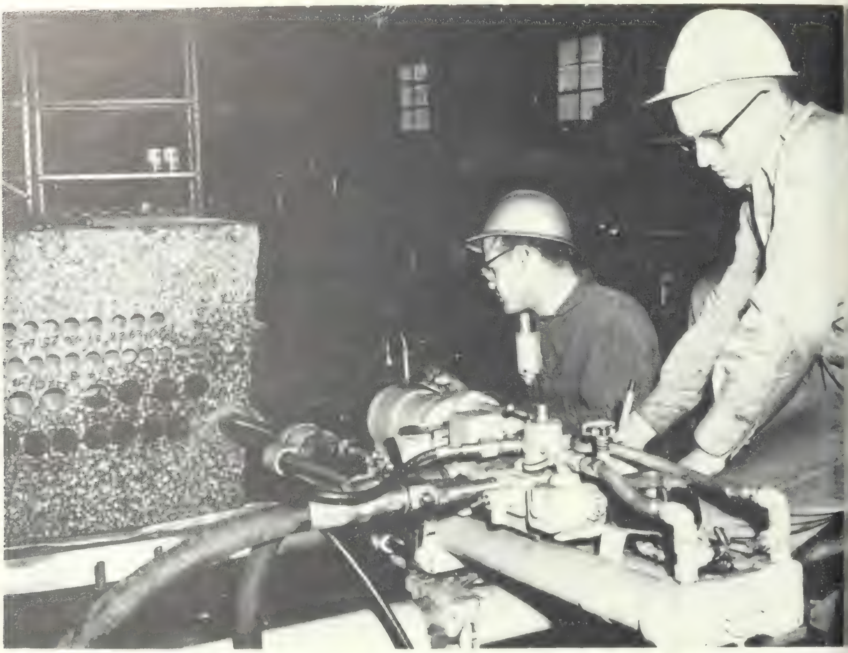


*This Bureau metallurgist is separating cobalt from a nickel solution before the solution is processed electrolytically to obtain a high-purity nickel metal.*

The Bureau's research in physical chemistry continued to provide basic thermodynamic data, essential to scientific progress, on heat capacity, heat of formation, entropy, and other properties of metals and compounds. Reports were published on the thermodynamic properties of many minerals and metals, including scandium, antimony oxides, sodium molybdate and tungstate, strontium bromide and nitrate, zirconium fluoride and sulfate, calcium vanadate, sodium- and calcium-alumina silicates, erbium, and bismuth and cerous chlorides. In addition, as a result of public demand, the Bureau combined and republished four of its earlier Bulletins on theoretical metallurgy.

## *Mining Systems Analyzed*

Research on mine-systems analysis advanced as industrial engineering principles were applied to operational problems. Studies to develop permissible angles for slopes of open-pit copper mines continued and progress was made in devising mathematical and statistical techniques to indicate probability and cost of mineral discovery. Procedures were devised to determine rock permeability and to aid in a



*Bureau mining studies are emphasizing development of new techniques an equipment like the electrohydraulic diamond drill shown here.*

predevelopment estimation of mine-water-control problems. Explo sive anchorage of rock bolts for underground support in softer rock showed promise. A new series of tests was begun with Burea developed precast concrete support sets of improved design. Invest gations of hydraulic transportation of solids for mine-stope fill materi were completed, in preparation for research to determine the effectiv ness of fill material in ground support. Bureau mining enginee cooperated with industry to develop devices for determining stres deformation in rocks and concrete linings around slusher and haulag drifts in mines using block-caving methods.

Progress also was made in rock physics, chiefly in isolating caus of the high pressures and stresses that cause severe ground-contr problems in deep mines. Work was underway to develop metho of interpreting these stresses so that mines can be designed scienti ically to provide for better and safer ground support and improve rock-burst control.

Blasting phenomena recorded during field tests with a new mobi laboratory yielded information on the effect of "coupling" and t correlation of strain propagation laws for conventional blasting wit low-yield nuclear explosives.

Design specifications for constructing a borehole deformation gage to determine stress in mine rock were published by the Bureau during the year. Widely circulated throughout the mining industry, this was the first publication of its type to have practical application in stress analysis of mine structures.

## *Titanium Technology Aided*

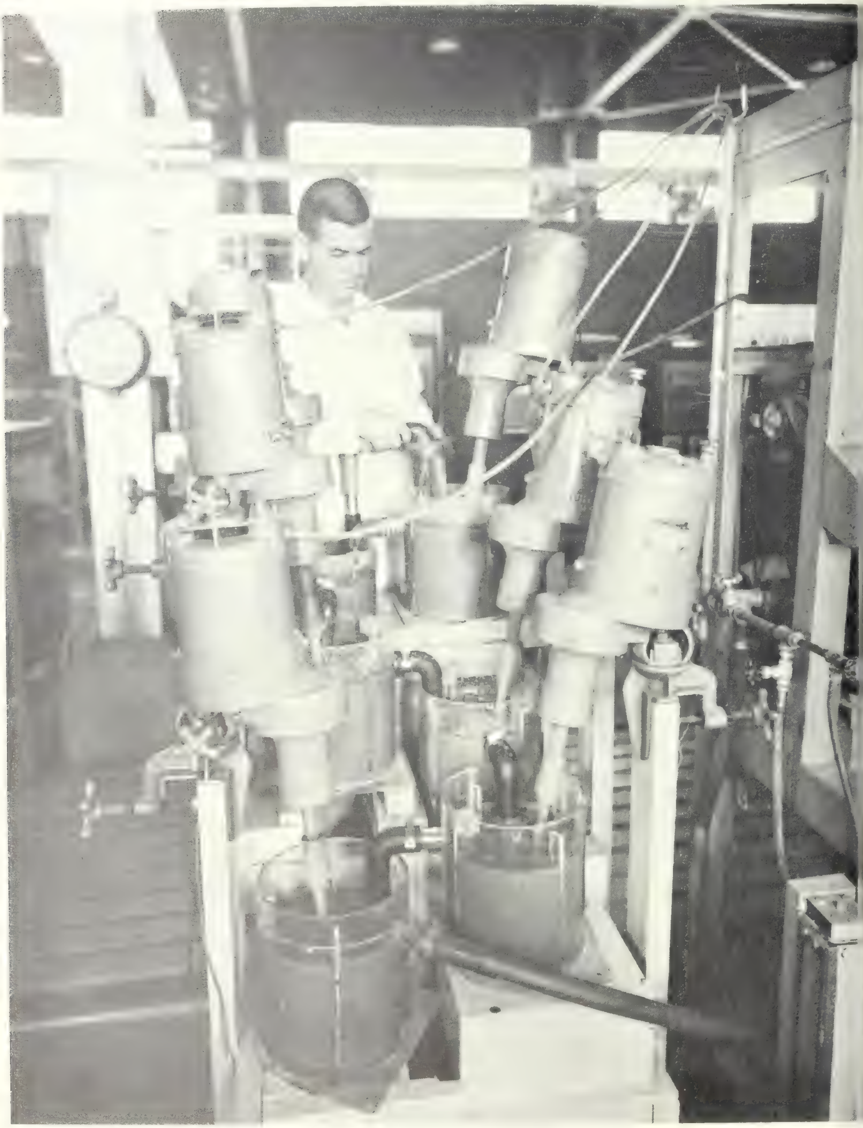
Electrowinning of titanium metal was advanced in 1962. Bureau metallurgists, developing a theory on the reaction between titanium metal and titanium chlorides in fused salts, devised an improved salt bath, which makes it possible for titanium metal to be deposited from a liquid anode. They also learned that certain titanium alloys can be deposited electrolytically. These and other studies on fundamental principles of electrolysis led to a better understanding of electrochemical reactions in fused salts.

An apparatus devised by the Bureau established that magnesium can be induction-melted and heated under pressure to temperatures above its boiling point without excessive loss by vaporization. Studies continued on ways to relate the composition and structure of dilute magnesium alloys to their strength and damping capacity.

Operation of the Bureau's experimental pilot plant at Kings Mountain, N.C., terminated after it had fulfilled its purpose by proving the practicality of the Bureau-devised flotation method for concentrating beryl from the tailings of a spodumene mill. A patent was issued for a process of separating spodumene and beryl by flotation, developed by the Bureau in an earlier study of the same pegmatite tailings. Phenacite- and bertrandite-bearing beryllium ores from Nevada were upgraded by flotation. Studies of bertrandite-bearing tuff from Utah indicated that it cannot be beneficiated but that bulk-leaching methods may extract beryllium. Research continued on ways to produce extremely pure beryllium by electrorefining. High-purity beryllium chloride was produced as a starting material for electrolytic reduction to high-purity metal.

## *Search for Domestic Sources of Alumina Continued*

Experiments continued on recovering alumina from low-grade bauxites and other aluminous materials. Extensive process evaluations were made of three techniques to recover alumina from what are now noncommercial sources. Research progressed on a lime-soda-sinter process, and a new project was begun to determine chemical requirements for a melt-quench-leach process. A Bureau modification of the Bayer process was used in experimental processing of samples of iron-bearing bauxite material from Hawaii.



*Beryllium ore, ground to a pulp, is "conditioned" in this multistage unit a a Bureau of Mines laboratory before being processed further to separate th valuable minerals from the waste material.*

The Bureau devised a new method for separating hafnium fron zirconium. Hafnium-containing zircon is fused with potassium silico fluoride to form soluble hafnium and zirconium compounds.

Metallurgical research on the rare earths included studies of thei basic properties, as well as methods of separation, analysis, meta reduction, and refining. Large homogeneous cerium ingots were produced from metal tapped from a continuously operated electrowinning cell. The purest cerium metal ever assayed was produced by the Bureau during the year.

A modified solvent-extraction technique promised effective separation of yttrium from heavy rare-earth elements, and a new cell design reduced contamination of electrowon yttrium by carbon and oxygen. Improved recovery of yttrium and thorium from western thorite ores was achieved by solvent extraction, and a potential source of scandium was found in impure phosphoric acid at phosphate-rock processing plants.

## *Radioactive Pollution Minimized*

The Bureau developed new techniques for beneficiating low-grade uranium ores and for minimizing radioactive pollution of surface waters from uranium mill wastes.

The reduction-segregation copper process—developed by Bureau scientists and first applied commercially to refractory oxidized copper ores in Arizona—proved applicable in pilot-scale tests on mixed oxide-sulfide copper ore from Mauritania, Africa. Other reports described techniques for gaseous reduction of blister copper and improved smelting of copper precipitation dusts. A froth-flotation concentration method for removing mica, feldspars, and other minerals from pollucite, leaving a product containing 20 to 30 percent cesium, was reported.

Studies were made on separating and purifying nonferrous metals by such techniques as using inert-gas carriers of volatile metals, adding flux to remove an impurity selectively, and adding another metal to combine with or modify the reaction of a metallic impurity during vacuum distillation.

As a first step toward improving zinc-base alloys by adding rare-earth metals, a new means of measuring molten-metal fluidity was devised.

## *Novel Attack on Air Pollution*

In a major step to recover a useful product from noxious gases formerly discharged to the atmosphere, the Bureau developed a process to produce hydrofluoric acid from waste fluosilicic acid. More than nine-tenths of the fluorine in certain waste gases was recovered as relatively pure hydrofluoric acid with the new process.

Research continued on preparing pure metallic boron for high-temperature and electronic applications. Consolidated polycrystalline, high-purity boron was prepared by melting amorphous boron in an electron-beam furnace. Experiments in remelting boron and in growing boron crystals were conducted in an arc-image furnace.

Synthetic-mica research furnished data on properties of germanium-containing mica, how to promote growth of large crystals, and how to prepare machinable dielectrics by devitrifying mica glasses. Efforts by the Bureau to improve the properties of its reconstituted mica paper included making the paper from new experimental melts of water-swelling micas and forming the film from which the paper is made with various flocculating agents. Cooperative research developed a mica flotation process which the cooperating firm adopted to increase recovery of mica at its plant near Heflin, Ala.

Basic studies continued during the year on the properties of high-temperature refractory oxides of zirconium, hafnium, and severa rare-earth elements, using equipment and methods specially developed by the Bureau for the purpose. Research was begun on mixed borides and boride-oxide systems which hold promise as high-temperature refractories. Data from these studies may make it possible to design high-temperature refractories with special properties required for specific applications, without using costly and time-consuming trial-and-error methods.

## *Ceramics Rolled to Shape*

Bureau engineers conducted research on roll forming various ceramic materials to close dimensional tolerances. Specially designed equipment maintained rolling temperatures as high as 1,500° C. Thickness of aluminum-feldspar billets was reduced as much as 75 percent New equipment designed and constructed during the year will permi roll forming at temperatures as high as 1,900° C, greatly extending the usefulness of this method.

Many large deposits of fire clay in Missouri and Ohio which contain excessive quartz, pyrite, and other impurities can now be upgraded to meet high-heat-duty and superduty refractory requirements as th result of research conducted by the Bureau. Studies on kaolin beneficiation yielded improvements in continuous, closed-circuit grinding producers of paper-coating clay conducted similar research using Bureau-developed equipment and processes. Sampling and evaluation of clays and shales for potential use as raw materials in producing lightweight aggregate continued in the Midwestern, Southeastern, and Northeastern States to meet the rapidly expanding demand for thi important construction material. The work was performed in cooperation with other Federal agencies, State agencies, and industrial concerns.

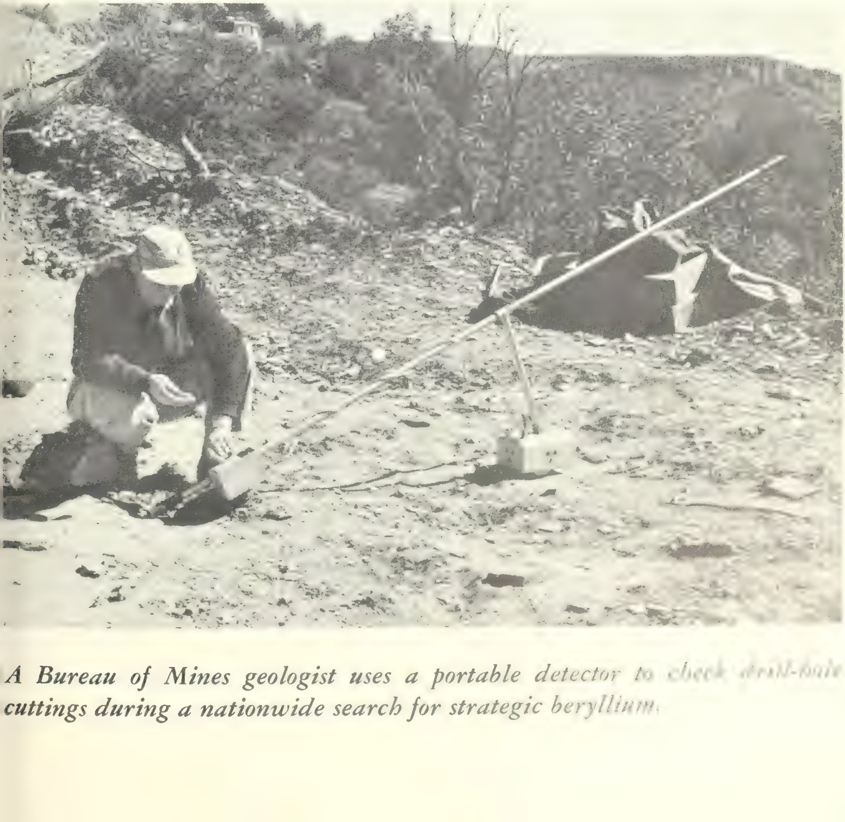
Observations were made at quarries in Iowa and Ohio to help determine the laws governing propagation of ground vibrations resulting from quarry blasting.

## *Mineral-Resource Activities*

Bureau of Mines engineers and mineral economists carried forward examinations of mineral deposits, studies of mineral-economics problems, and investigations of mining and milling methods and costs in almost every State. At least 50 reports of these studies were issued or in process at the end of the fiscal year, in addition to the separate State chapters making up volume 3 of the Bureau's Minerals Yearbook. Technical advice and assistance were furnished to other Federal and State agencies, local area redevelopment groups, and the general public.

### *Many Resource Surveys Conducted*

Examinations and surveys of mineral resources, many conducted in cooperation with State agencies, covered a wide range of commodities and localities.



***A Bureau of Mines geologist uses a portable detector to check drill-hole cuttings during a nationwide search for strategic beryllium.***

Areas of potential beryllium mineralization were examined in Arizona, California, Colorado, Idaho, Nevada, Texas, and the New England States. In Idaho, the investigations provided information on 30 beryllium occurrences, two-thirds of which were previously unknown. The known area of low-grade beryllium mineralization in Idaho's Sawtooth Mountains was extended by drilling and sampling to more than 40 square miles.

Bureau investigations in the Beluga coalfield, Alaska, were completed during the year. Core drilling indicated subbituminous coal reserves in excess of 20 million tons in a seam over 50 feet thick and apparently suitable for opencut mining. The State of Alaska took title to the Beluga area from the Federal Government as part of the statehood grant lands and already has issued several coal-prospecting permits to private companies.

Several other significant mineral-economics projects completed during the year included an analysis and projection of the future of Alaska's mineral industry, a similar report on the aluminum industry of the Pacific Northwest, and a report on the petroleum resources of West Virginia. An important new project begun in fiscal 1962 was a study of the mineral-resource base of the Pacific Northwest for the Department's Bonneville Power Administration. It will include estimates of future employment and electric-power requirements for mineral production as basic data for determining the long-range electric-power needs of the region.

A survey of mineral raw materials used by producers of chemicals and allied products in California and Nevada was nearly completed. Facilitated by excellent industry cooperation, this study is expected to make available for the first time significant data on requirements and sources of supply for minerals used in the chemical industries.

## *Water Resources and Uses Studied*

Bureau engineers completed a comprehensive study of water in relation to Arizona's mineral industries, covering such aspects as supply, adequacy, cost, treatment, uses, and disposal. The experience gained is expected to prove useful in conducting similar investigations and in forecasting requirements for other parts of the Nation. In progress at yearend was a survey of water requirements and uses in petroleum producing and refining industries of the Southwest.

Among several reports covering significant mining and milling methods and costs was one describing the role of automatic data processing (ADP) in managing a Michigan copper mine. The Bureau increased its own use of ADP in its statistical work and was considering applying ADP to data retrieval problems.

### *Economic Variables of Mineral Industries*

During the year, the Bureau continued and expanded its studies of the basic economic variables most significant for the mineral industries. Reports were published on cyclical variations in the copper, lead, and zinc industries; on the demand for salt; and on the source and disposition of energy in the United States. The salt and energy studies illustrated methodologies and techniques which can be applied or adapted elsewhere to advantage.

As the year ended, the Bureau was developing a study of the materials and supply requirements of the mining industries for use in a Government-wide investigation of interindustry flows of commodities.

## *River-Basin Activities*

Bureau of Mines participation in river-basin activities expanded substantially in fiscal 1962. Requests from other Federal agencies for review of projects for flood control, harbor improvement, electric-power generation, soil conservation, water supply, and other purposes increased from 158 in 1961 to 248 in 1962. These were exclusive of many informal field-level reviews and extensive office and field investigations. The Bureau also assisted and guided other State and Federal agencies engaged in preauthorization negotiations and preconstruction planning. It completed 20 mineral reconnaissance surveys for the Department's Bureau of Reclamation and the U.S. Army Corps of Engineers. Of 30 other similar surveys conducted on proposed reservoir sites for the U.S. Study Commission—Texas, 13 called attention to major mineral problems that require resolution either before authorization or during preconstruction planning.

Such river-basin studies protect the national interest in several ways, indicating what minerals must be mined before inundation, what minerals can be recovered after inundation, and what other minerals can be removed after inundation if suitable provisions are made in advance.

### *Rampart Reservoir in Alaska Studied*

In Alaska, the Bureau worked closely with the Corps of Engineers to delineate and evaluate mineral resources in the 11,000-square-mile Rampart Reservoir site and to determine the economic effect of a proposed 5-million-kilowatt power development on the mineral resources and industry of the State. Bureau staff participated in meetings of the Rampart Economic Advisory Board and contributed to plans for additional mineral-resource studies.

### *Missouri Basin Studies Continued*

Reconnaissance examination of 13 proposed reservoir sites in the Missouri River basin were made to determine how construction of dams would affect mineral resources and mineral industries in the immediate areas. Analyses of benefits and damages at each of the sites were submitted to the construction agency concerned, and in several instances, conservation methods were suggested to safeguard major mineral deposits. A reconnaissance of the Fort Peck-Fort Benton reach of the Missouri Basin in Montana was reported to the Secretary of the Interior.

Mineral-resource and industry-feasibility studies on the Turtle Mountain and Fort Berthold Indian Reservations in North Dakota and on the Blackfeet Reservation in Montana were completed. Similar studies began on four other reservations in the Dakotas, Montana, and Wyoming. These studies will aid in preparing overall economic development plans for the Area Redevelopment Administration and in planning for the economic development of the reservations. Studies on the mineral resources of the Milk River basin in Montana and its mineral-industry water needs and supplies were in progress as the year ended.

Manuscripts on the oil and gas resources of the Yellowstone Basin in Montana and on the fusibility characteristics of lignite ash were completed. The report on waterborne mineral wastes and industrial water uses in Kansas and Missouri was published and distributed. Further field research on techniques and materials for lining canals confirmed the effectiveness of sodium carbonate in reducing seepage and preventing erosion when the material is sprayed directly on simulated damp canal banks.

## *Air-Pollution Control*

The Bureau of Mines—cooperating with the Public Health Service of the Department of Health, Education, and Welfare—intensified its already active participation in Federal air-pollution-control programs At research centers in Pittsburgh, Pa., Bartlesville, Okla., and Laramie, Wyo., the Bureau sought to pinpoint sources of pollution as mineral fuels were burned for heat and power and sought to evolve methods of altering or improving combustion to reduce pollution The Bureau continued to represent the Department of the Interior on the Interdepartmental Committee on Community Air Pollution as well as on the Air Resources Subcommittee of the Natural Resources Committee, Federal Council for Science and Technology.

Giving special emphasis to studies of air pollution caused by automotive exhausts, the Bureau developed new information on catalytic and flame-afterburner treatment for noxious components of gasoline-engine exhausts, and on the organic compounds present n the exhausts of diesel engines. Methods were devised for sampling and analyzing products from a special test chamber in which engine exhaust gases undergo reactions simulating those that take place under usual outdoor conditions.

*Scientists and engineers at this Bureau of Mines pilot plant are fighting an important battle in the war against pollution. They are developing an improved method for removing the pollutant, sulfur dioxide, from industrial flue gases.*

Gas-chromatograph analytical procedures, developed originally for studies of gasoline-engine exhaust gases, were adopted for use on products of diesel combustion. Although they cannot yet be used to separate and identify all significant exhaust components, the methods constitute a marked advance in analytical capability. Bureau scientists demonstrated the feasibility of a method they recently developed for removing sulfur dioxide from flue gases, and also provided new information on concentrations of oxides of nitrogen and sulfur in boilers of coal-burning furnaces. As part of a national survey of fires in coal-mine refuse piles, these fires were cataloged by general location, size of pile, and stage of burning.

## *Bituminous Coal Activities*

Bureau research continued to stress improved methods of mining, preparing, processing, and using bituminous coal and lignite.

Experiments in which a high-pressure water jet was used to extract coal from the Pittsburgh bed in western Pennsylvania indicated that productivity rates depend on the velocity and volume of the water jet and the speed with which it traverses the coal face. The hydraulic method also was tested in mining pillars in a pitching coalbed near Roslyn, Wash., and productivity during the experiment was 50 percent higher than that achieved by conventional methods under the same conditions.

Combustible methane was removed in advance of mining by two methods applied by the Bureau in a series of experiments conducted in a cooperating mine in the Pocahontas No. 4 coalbed in West Virginia. In one method, methane escapes from the coal through holes drilled horizontally into the seam. In the other, water is injected into the coal seam to force the gas out. These experiments not only produced much safer atmospheres but indicated that costly shutdowns, normally required for removal of gas by conventional ventilation during mining, can probably be avoided.

Hydraulic transportation of larger sized coal was investigated to determine the feasibility of combining hydraulic mining processes with coal pipelines. Over 40 percent by weight of coal up to 2 inches in diameter was moved successfully in water in a 6-inch-diameter test pipe 1,350 feet long.

A comprehensive study of concentrating tables for cleaning coal indicated that their performance can be predicted more accurately than was previously realized.

## *Utah Coal Studied for Use in California*

In cooperative research, the Bureau found that a virtually unused low-grade coal from southern Utah can be upgraded for use in cement manufacturing in California and that more of California's increasing energy requirements may later be supplied by coal from the Rocky Mountain area.

Further progress was made in developing a coal-fired gas turbine for central-station powerplants. Operated in conjunction with a standard steam boiler, such a coal-fired turbine promises a 4- to 8-percent increase in overall efficiency. Used as a separate unit, the turbine—requiring no water—could prove an ideal power generator in water-scarce areas.

A new pilot plant reactor for continuous entrained-state carbonization of coking coals permits operation at high capacities and temperatures and facilitates study of optimum reactor length.

Investigations were made of the effect of rank of coal, fuel-bed thickness, grate speed, and airflow rate on the yield and quality of cokes produced for use in chemical processes in chain-grate stokers, a type of equipment now attracting considerable industrial interest.

Radiant heat-transfer studies showed how ash and slag deposits are important in determining heat distribution in large steam-boiler furnaces.

A method was developed for feeding pulverized coal in steam to an oxygen-blown gasifier operating at pressures of 150 to 300 pounds per square inch. In research aimed at obtaining gas from eastern coking coals, these coals were heated systematically in steam and air to reduce their coking properties.

## *Lignite Uses Studied*

Extensive experimentation in ways of using lignite and subbituminous coals continued. This included using artificially oxidized lignite and leonardite (naturally oxidized lignite) for soil conditioning and for fertilizing, and further work in developing the Bureau's fixed-bed slagging lignite gasifier.

Cooperative experiments conducted with funds supplied by the Atomic Energy Commission examined the effects of gamma radiation on the reaction of coal with steam. The Commission continued to support research on using a simulated reactor to provide a high-temperature heat for coal processing.

Low-cost, active catalysts for synthesizing methane from carbon monoxide and hydrogen were prepared by flame spraying thin layers of metals and metal oxides on plate or tube surfaces inside a reactor

Process development continued on converting bituminous coal to high-B.t.u. gas. Experiments demonstrated that such gas can be produced directly by hydrogenation of coal with a low hydrogen-to-coal ratio, making the removal of excess hydrogen unnecessary. Promising results indicated that gaseous products from the reaction of coal and steam at high pressure, including the bulk of normally unreactive carbon dioxide, can be upgraded to high-B.t.u. gas by passing them over a tungsten sulfide catalyst without intermediate removal of sulfur.

Removal of sulfur from high-temperature coke with coke-oven gas may be a means for producing metallurgical coke from coals presently unsuitable because of excessive sulfur.

Catalytic hydrogenation of coal to yield large quantities of hydrogen was achieved for the first time. More than half the hydrogen in a typical Pittsburgh-seam coal was liberated by heating the coal in a nitrogen-containing solvent in the presence of a palladium catalyst.

Microbiological studies were extended to include the lower ranks of coal. Up to 80 percent of the pyritic sulfur in some of these coals was removed by bacterial action. Using other bacteria to remove methane from coal mines was being investigated at yearend.

*In research on obtaining new or improved products from one of the Nation' most abundant resources, Bureau scientists are reacting coal at extremel high temperatures in this "plasma jet" unit . . .*

*. . . and at high pressures in the experimental apparatus shown here.*

Other studies included irradiating coal in an atomic pile at high levels of neutron and gamma flux, reacting coal in a plasma jet at extreme temperatures—up to 30,000° C, hydrogenating oil from coal to make fuels for supersonic jet aircraft, producing carbon disulfide from coal, and upgrading low-temperature tar to commercially valuable products.

## Bituminous Coal Economics Analyzed

The downward trend in bituminous coal and lignite production was reversed in fiscal 1962. Much of the gain resulted from steadily increased consumption of coal by electric-power utilities, and this trend is expected to continue. Special economic studies were made of the distribution and consumption of coal as related to the competitive energy market. Other special analyses by the Bureau of Mines spotted significant trends developing in worldwide energy supplies and utilization. Comprehensive reports were made to other Federal agencies on both domestic and foreign developments related to the role of coal, coke, and coal chemicals in mobilization planning.

*A high-speed framing camera, developed by the Bureau, is used to obtain new knowledge about explosives and explosions. The seven frames shown at the extreme right are part of sequence recording an event that took place in 0.00008 second.*

## Explosives and Explosions Studied

The Bureau completed a new high-speed photographic installation for studying explosions and detonations. Its equipment includes a new high-speed framing camera (top speed, 25 frames in 0.00002 second) and a streak camera for making displacement-versus-time records (maximum image sweep rate, 5,000 meters per second). The same event can be recorded simultaneously with both cameras. A two-channel submicrosecond (one-ten-millionth-of-a-second exposure) flash

X-ray system—also acquired during the year—was used to study high-speed events in opaque materials, such as shock and detonation waves in solid explosives and hypervelocity impact on metals.

Self-sealing plastic bags filled with water were approved by the Bureau as permissible for stemming borehole shots in coal. Other research on permissible explosives and blasting agents is providing information that will be helpful in promoting safer use of these materials.

Further cooperative study—with the Manufacturing Chemists Association—on the fire and explosion hazards of ammonium nitrate in pure form and with various contaminants yielded valuable information on its safety characteristics. Studies on the explosion hazards of liquid hydrogen were extended to problems associated with its use in high-energy nuclear-physics laboratories.

Several accidents involving fires and explosions were investigated. Potential hazards involving a number of flammable materials were studied and the results were published.

Major noise and blast effects were eliminated by constructing a new closed gallery for testing explosives at Bruceton, Pa. Good results in curtailing noise also were obtained by enclosing a number of bombproof structures used in explosives research.

## *Anthracite*

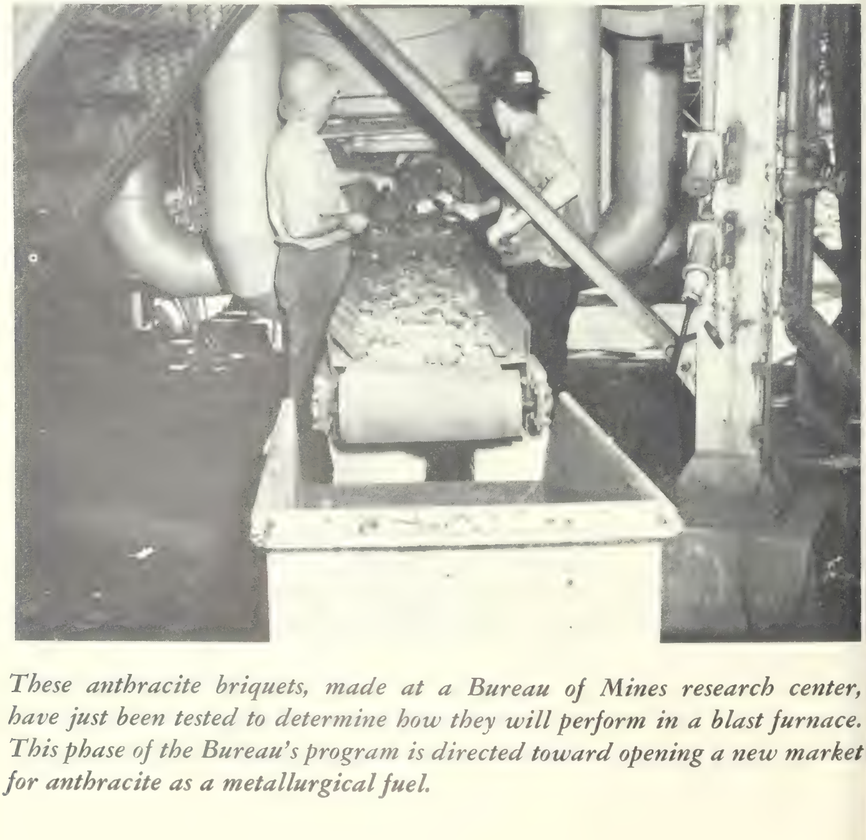
During the year, the Bureau continued to develop improved methods for mining and transporting anthracite and preparing it for market and further investigated its metallurgical and fuel potential, particularly in blast furnaces. Fundamental chemical, electrical, and physical properties were studied. The Bureau's administrative, engineering and inspectional services again implemented jointly financed Federal and Commonwealth of Pennsylvania programs for controlling mine waters and inactive coal-mine fires in the anthracite region.

Underground demonstrations of the Bureau's prototype hydraulic anthracite-mining system aroused great interest. Regular operation of this system in a cooperating mine at Sugar Notch, south of Wilkes-Barre, Pa., proved its technical feasibility and superior safety. By eliminating blasting the system avoids such hazards as airborne coal dust and dislodged roof supports, as well as the danger of storing, handling, and firing explosives underground. To handle up to 5,000 pounds of pressure at the water-jet nozzle—higher than the pressure required for "soft" coal—the anthracite monitor is mounted on a self-propelled chassis called a jumbo.

Extensive surface tests of the Bureau's experimental hydraulic hoisting apparatus proved its mechanical effectiveness. At yearend, negotiations were underway to place the equipment in an operating underground mine for final on-the-job testing before it is considered for integration with the hydraulic anthracite-mining system.

A large quantity of anthracite briquets—formulated, manufactured, and calcined at the Bureau of Mines Anthracite Research Center, Schuylkill Haven, Pa.—performed favorably in the Bureau's experimental blast furnace at Bruceton in a series of runs concluded in May 1962. Evaluation of the data commenced in preparation for Bureau of Mines publication. Under a cooperative agreement with a major steel producer, other tests to develop pressure-drop data for blast furnaces were continued in the simulated stock column at Schuylkill Haven.

Two mine-water control projects were completed. One costing about $80,000 provided surface improvements at the Wanamie mine. The other was a $190,000 deep-well pump installation at the South Wilkes-Barre shaft. The Bureau's study of the effect of vast underground mine workings on the stability of surface improvements in the



*These anthracite briquets, made at a Bureau of Mines research center, have just been tested to determine how they will perform in a blast furnace. This phase of the Bureau's program is directed toward opening a new market for anthracite as a metallurgical fuel.*

Susquehanna River basin of the northern anthracite fields was about 25 percent completed, and an interim report was submitted to the U.S. Army Corps of Engineers.

### *Auger-Type Borer Ordered*

A contract was awarded for constructing a large-diameter auger-type boring machine designed to Bureau specifications for work in pitching anthracite seams. When delivered, the machine is to be used in a cooperating mine where it is expected to reduce underground mining costs by improving productivity rates.

Survey schedules for collecting anthracite production and distribution data were revised during the year, and increased response and coverage were achieved.

## *Health and Safety Activities*

Safe and efficient mine operations remained the principal objective of Bureau health and safety programs during the fiscal year as progress was made in mine-roof control, development of a practical methane-monitoring system for gassy mechanized coal mines was advanced, and several new types of mining equipment received the Bureau's seal of permissibility.

Highlighting the year were experiments and field tests that demonstrated the versatility of rigid polyurethane foam in sealing and maintaining the stability of mine openings, controlling ventilation, combating mine fires, and insulating combustible material from heat. Made by combining two readily available chemicals that expand in seconds to many times their volume, this foam, which becomes rigid in a few minutes, promises to be useful in many phases of mining.

Early in 1962, the Bureau was designated by the Secretary of the Interior to conduct field and other investigations needed to carry out Public Law 87–300, which authorized a study of health and safety conditions in metal and nonmetal mines (except coal and lignite). A three-member Mine Safety Study Board was appointed by the Secretary to help guide the work. The information obtained will be reported by the Secretary to the Congress, with his evaluation of present conditions in this sector of the mining industry.

### *Roof Hazards Studied*

Research on ways to prevent unexpected roof falls continued as the Bureau sought to provide more scientific methods of control. A compact, portable sonar device, designed in 1961 to detect hidden roof weaknesses, demonstrated its sensitivity and reliability in extended laboratory tests.

Causes of coal bursts or "bumps" also were investigated. Special hydraulic load cells, developed by the Bureau, were used to measure internal stresses in coal-mine pillars and adjacent rock strata at a West Virginia coal mine susceptible to "bumps." Preliminary results were encouraging.

Investigation of pressures caused by water or gas in coal-mine roof indicated that such pressures contribute to roof failures. Additional tests to determine how these pressures are generated and to devise means for their control were underway at the end of the year.

Continuing research was directed toward improving roof-bolting equipment and accessories and toward providing basic information on effective functioning of bolt assemblies. These studies involved measuring rock hardness with a "penetrometer," to find quickly the best anchorage "horizon" for roof bolts; modifying the size and adaptability of roof-bolt anchorage test equipment; standardizing tests of bearing plates and other roof-bolting materials; and developing a simple roof-bolt-tension indicator to obtain greater uniformity in bolt installations.

*Bureau of Mines engineers test a device newly developed by the Bureau fo determining whether roof bolts are securely anchored in the layers of eart and rock they are designed to support.*

Related laboratory research continued on strengthening mine roof by injecting bonding agents made of polyester resins into roof cavities and planes of weakness. Field tests at intersections of coal-mine entries indicate that such bonding reinforces roof bolting. Tests in a metal mine also showed safer, more economical consolidation of fractured metamorphic rocks when bonding agents were used to supplement roof bolts.

## *Mine Ventilation Analyzed*

Ventilation surveys were conducted in two coal and two noncoal mines. The Bureau's fluid network analyzer was used to advantage in planning effective ventilating systems. Healthful working atmosphere also is the objective of a cooperative study, begun during the year, of mine air conditioning at a Montana copper mine. The knowledge gained will be increasingly valuable as mining extends to greater depths.

Tests in the Bureau's experimental mine at Bruceton, Pa., demonstrated that water, when properly mixed with coal dust, neutralizes the explosion hazard of the dust. However, it was found that water

*Using a small blower device, a Bureau of Mines scientist dispenses a cloud of cellulose acetate dust over a lighted candle, demonstrating one of the hazards encountered in handling combustible industrial materials.*

naturally present in a mine ordinarily cannot be depended upon to achieve this effect.

Effects of particle size and shape and of concentration on ignition sensitivity and explosion severity of many combustible dusts were determined during the year.

## *Methane-Monitoring Research Progressed*

Three prototype methane-monitoring detectors were tested extensively in the experimental mine to determine performance and stability under conditions of temperature, humidity, and airflow normally found in mines. Results for two of the units were so promising that they will be further tested in an active coal mine.

Fundamental research on controlled combustion of methane yielded information that will be helpful in improving methane detecting and monitoring devices. In another approach to the same objective, the Bureau began development of simplified transistorized circuits for methane monitors.

## *New Equipment Approved*

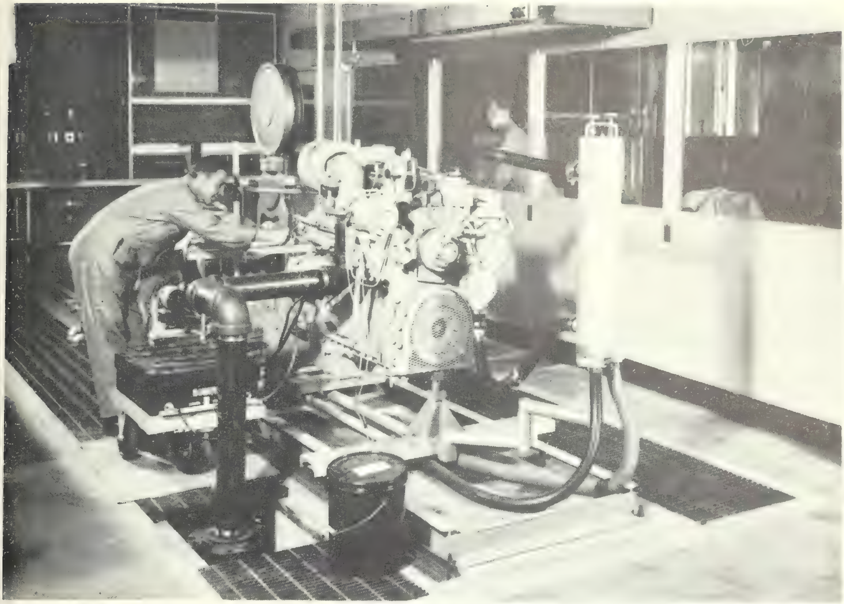
Demand continued for the Bureau's technical services and testing facilities to determine permissibility of electric- and diesel-powered mining equipment and related devices required by modifications and improvements in mine mechanization.

The first diesel-powered machine—a shuttle car—was approved for use in gassy noncoal mines and tunnels. Subsequently, additional approvals were issued for six diesel-powered locomotives, three tractors, and two shuttle cars. Five diesel-engine subassemblies with exhaust-gas conditioners were certified for use on approved diesel machines in noncoal mines.

Bureau approvals also were issued during the year for the following kinds of electric-powered equipment: 10 continuous miners, 3 conventional mining machines, 9 shuttle cars, 9 loading machines, 10 conveyors, 7 face drills, 3 distribution boxes, 1 splice box, 1 roof-bolting machine, 9 utility trucks, 2 rock dusters, 2 drill-boom carriers, 2 coal crushers, 2 air compressors, 1 drill dozer, 1 hydraulic pump unit, 2 communication devices, and 1 dust-particle counter.

In all, there were 265 formal approvals and 722 informal extensions of approval for electrical-mechanical equipment. Fifty-nine compartments were explosion-tested, and 2,052 tests were made in explosive natural gas-air mixtures. Flame tests were given 15 conveyor belts and 24 electric cables, including the first Hypalon-covered cable.

Eleven approvals and 20 extensions of approval were issued for coal-mine roof drills with integral dust-collecting systems. Twelve



*Mining equipment is tested rigorously before it is approved for use underground. Here, a Bureau technician samples exhaust gases generated by a diesel engine that has been submitted by the manufacturer for testing.*

approvals and 123 extensions of approval were granted various respiratory-protective devices.

Three approvals, covering 5 fire-resistant hydraulic fluids, and 1 extension of approval, covering 2 fluids, brought to 15 the total of approvals covering 30 fire-resistant hydraulic fluids issued since the Bureau began testing these materials.

## *New Health Studies Launched*

Dust generated by continuous-mining machines in coal mines is the subject of a new Bureau project aimed at developing methods for alleviating this problem. A newly developed "referee" dust slide for use in teaching dust-counting techniques will be useful for comparing dust counts by different laboratories and in developing new counting procedures.

Portable, commercial, tube-type detectors were evaluated—under controlled laboratory conditions—for effectiveness in detecting toxic mine gases, carbon monoxide and nitrogen oxides in engine exhausts, and piston blowby gases from diesel engines. Chemical effects of nitrogen oxides in low concentrations in air also were studied. Other tests were made to determine the nature and quantity of toxic gases produced when rigid polyurethane foam is subjected to heating and combustion reactions.

Procedures were developed for testing dispersoid respirators designed to protect against highly toxic particles in air. Nearly 200 samples of airborne dust, minerals, and dust-source materials were analyzed by X-ray diffraction and emission spectrography. Approximately 20,000 atmospheric samples from coal-mine inspections and other sources were analyzed in the Bureau's three gas-analysis laboratories.

## *Silicosis and Radiation Hazards Studied*

Joint studies by the Bureau of Mines and the Public Health Service to evaluate the silicosis problem in metal mining, begun in April 1958, were completed during the year. The Bureau appraised the environmental aspects, and the Public Health Service the medical aspects of the problem. Sixty-seven representative underground metal mines were investigated, and 14,000 workers were examined. A report is now in preparation.

Investigations in uranium mines were continued, making use of a new method to evaluate health and safety hazards, particularly the full-shift, weighted-average exposure of workers to alpha-emitting decay products of radon. At the request of State authorities, the Bureau inspected health and safety conditions in 54 uranium mines in Utah. It continued to cooperate with the Public Health Service, Atomic Energy Commission, and Federal Radiation Council on worker exposure to radiation in uranium mining.

## *Safety Education Extended*

More than 5,300 mineral-industry workmen and officials completed training in the Bureau's various accident-prevention courses during the year. Emphasis on training mine supervisors in fundamentals of accident prevention continued as enrollment in these courses increased 25 percent over the previous fiscal year. Twenty-nine thousand workers completed first-aid and mine rescue training. Efforts to obtain 100-percent employee participation in first-aid classes were increasingly successful.

Two new motion pictures, as well as slides, posters, and other visual aids to safety education, were produced. One film dealt with the training of mine personnel in rescue and recovery work after mine disasters; the other reported Bureau research on hydraulic mining of anthracite, emphasizing safety. Films in the Bureau's safety series were viewed by 120,000 mineral-industry workers, and lecture-demonstrations of fire, explosion, and mine-gas hazards were attended by more than 68,000.

## *Safety Contest Sponsorship Broadened*

During the year the Bureau assumed full responsibility for the National Safety Competition, formerly cosponsored for 36 years by the Explosives Engineer magazine, which ceased publication in December 1961. More than 1,500 mines, quarries, and other mineral-industry operations competed in the National Safety Competition and other nationwide contests conducted by the Bureau in fiscal 1962, and more than 3,000 employees of winning companies were awarded certificates of accomplishment in safety. Contests covering operations in sand and gravel, slag, crushed stone, and lime were again cosponsored by active associations within those four industries. The first annual nationwide contest among oil-well drillers was carried to a successful conclusion, and arrangements were completed for the first contest to be sponsored by the National Limestone Institute.

The Bureau continued to report on injuries and employment in mineral industries. Information on fatal and nonfatal injuries and related data, gathered from operators of coal mines under authority of the Federal Coal Mine Safety Act, was issued monthly and annually. Statistics for metal, nonmetal, quarry, sand and gravel, coke, peat, iron blast-furnace slag, and petroleum and natural gas industries were published annually.

## *Fires in Inactive Coal Deposits Controlled*

During the year, 14 fire-control projects were completed—7 in the public domain, 3 on Indian land, and 4 on private property. At yearend, projects were underway to control or extinguish seven other fires.

Some 107 fires in inactive coal deposits have been extinguished or controlled with Bureau guidance since 1949, when funds were first appropriated for this purpose. Of these, 59 were in the public domain, on Indian lands, or on other properties where federally owned coal was threatened; and 48 were on private property, mostly in residential areas.

Bureau records showed 223 other uncontrolled fires were burning in inactive coal deposits at the close of this year. Of these, 105 had been investigated and their control will be undertaken as appropriated funds permit and as matching funds are available, where required. Work was performed on completed projects as necessary to keep fires from rekindling.

## *10th Anniversary of Federal Coal Mine Safety Act Noted*

Fiscal 1962 marked completion of the first full decade of inspection authorized by the Federal Coal Mine Safety Act. Title I of the act authorizes inspection of coal mines and reporting of hazards, including recommendations for their correction. Title II of the act provides specific enforcement powers to prevent major disasters from explosions, fires, inundations, and man-trip and man-hoist accidents in mines regularly employing 15 or more men underground.

Of the 9,993 coal mines active during the year, 1,045 were classed as title II mines. The rest, including 7,256 small underground mines, 1,413 strip mines, and 279 auger mines, were classified under title I.

During the year, 2,610 routine inspections of title II mines were completed. Special followup inspections also were made to determine whether previously cited violations had been corrected.

Orders requiring withdrawal of men from all or part of 64 mines totaled 117; 81 of these were at 49 mines because of imminent danger, and 36 orders were at 15 mines for failure to abate violations in a reasonable time. Orders were issued classing as gassy nine mines previously considered nongassy.

Federal inspectors and engineers also made 10,450 routine visits to title I mines (including 1,112 strip- and 232 auger-mine inspections) and conducted many roof-control, electrical, ventilation, dust, blasting, and related surveys, as well as investigations of fatal and serious accidents, mine fires, gas and dust ignitions, and miscellaneous conditions.

Preliminary reports for calendar year 1961 showed 292 coal-mine fatalities, compared with 325 in 1960. The fatality-frequency rate per million man-hours of exposure was 1.20 in 1961, compared with 1.15 the previous year. The fatality-frequency rate for the first 5 months of 1962 was 0.77.

A single major disaster occurred during the year, claiming the lives of 11 workers in an Illinois coal mine.

A nationwide survey of thermal-drying units is underway in bituminous coal preparation plants to prevent potential major catastrophes. Changes in design and operation, and additional safeguards, will be recommended to eliminate numerous dust ignitions that have occurred in these units. Thus far, all have been small.

## *Foreign Activities*

Bureau facilities for gathering and analyzing statistical and economical information on foreign minerals were used extensively by other Federal agencies, and U.S. industries and investors, during the year. More than 6,000 specific public and Government inquiries were answered. World production and international trade statistics comprised an important segment of the Bureau's Minerals Yearbook and numerous other continuing services were performed in maintaining the Government's mineral-information program.

In response to Congressional request for special studies in connection with a review of U.S. foreign trade policies, the Bureau analyzed production, trade, and mineral self-sufficiency of three groups of countries—the Sino-Soviet Bloc, the industrial West (including Japan), and the rest of the world.

*A Bureau engineer instructs Mexican miners in mine-rescue procedures.*

## *Commodity Imbalance Data Assembled*

Fundamental data were assembled by the Bureau on such international commodity problems as imbalances in world supply and demand for lead and zinc which have concerned Government and trade agencies for several years. World shortages of tin, disposal of surplus minerals from U.S. stockpiles, and the effect of expanding Soviet oil exports on U.S. and free-world petroleum economies also received attention.

During fiscal 1962, foreign aid field projects were served by 18 Bureau technologists in 10 countries: Afghanistan, El Salvador, Indonesia, Mexico, Nepal, Pakistan, Peru, South Korea, Taiwan and Turkey. Bureau laboratory and staff facilities in the United States also contributed to these projects.

An important part of foreign aid is training foreign technicians in the United States. During the year, the Bureau assisted 69 foreign trainees. At yearend, 36 were still in training under Bureau auspices. Countries represented included Afghanistan, Egypt, Indonesia, the Malagasy Republic, Mexico, Nepal, the Philippines, South Korea, Taiwan, Thailand, and Yugoslavia.

Exchange of scientific, technical, and economic information was fostered when several Bureau experts attended and presented papers at various international meetings. Bureau specialists also participated in discussions of mineral education in Latin America preliminary to formulating plans for U.S. assistance in this field.

More than a dozen detailed reports on foreign mineral resources and related subjects were prepared for publication during the year.

## *Administration*

Many aspects of the Bureau's administrative management were studied during the year. The National Academy of Sciences was asked to study the physical-facility requirements of the Bureau's metallurgical research program. The Bureau itself began a long-range study to define its future role in conserving and developing mineral and fuel resources and in maintaining the health and safety of mineral-industry workers. Other studies concerned themselves with the publication and use of mineral-production data, with new programing processes created by a change in the Bureau's budget structure, and with better ways of selecting among various proposals those most helpful in achieving program objectives. An earlier study designed to improve the quality of the Bureau's technical writing was implemented when the first Annual Publication Citation of the Bureau was awarded to the San Francisco Petroleum Research Laboratory for the best-written manuscript published in calendar year 1961.

### *Over 200 Cooperative Agreements in Effect*

More than 200 "cooperative agreements" were in effect during fiscal 1962. Under the terms of these agreements, certain Bureau research projects were partly or wholly paid for by funds not appropriated to the Bureau by Congress. Over half of the agreements were with private industry, State and local governments, colleges, universities, and nonprofit groups. The remainder were with various agencies of the Federal Government. The accompanying chart shows the amounts made available for expenditure by the Bureau during the last 3 fiscal years.

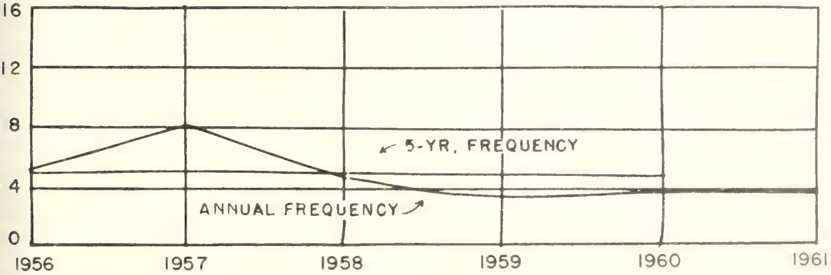
## *Inventors Granted 16 U.S. Patents*

Bureau scientists and engineers reported 12 new inventions, filed 14 patent applications, and were granted a total of 16 U.S. patents during the year. These patents were all automatically assigned to the Department of the Interior and are available for use without royalty payment by any citizen of the United States. The most licenses granted under any one Bureau patent in fiscal 1962 were for the use of a method of tracing the flow of liquids underground by the "postradioactivation" of tracer substances.

The Bureau continued effective space-utilization practices, disposing of inactive or duplicate records and reducing the volume of classified records in headquarters offices. Increased cooperation with the General Services Administration (GSA) accelerated transfer of records from Bureau office and file rooms to Federal records centers and improved the quality of reference service from the centers to the Bureau. Efforts were launched, in cooperation with GSA, to analyze file classification needs and to improve the Bureau's unified filing system.

## *Employee Health and Safety*

For the past 3 years, the frequency of injuries among Bureau of Mines employees has been maintained at 4.0 (or fewer) injuries for each million man-hours of work—see graph below:

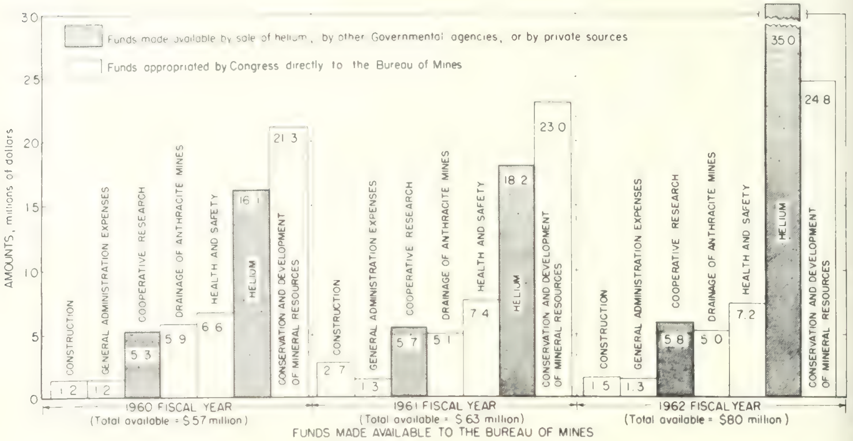


*Bureau of Mines disabling injury record*

The total amount of all funds made available to the Bureau of Mines in a given fiscal year is more meaningful than the amount expended in a year. Contracts are not signed until money is available, by appropriation or otherwise. A Bureau contract to build a pilot plant, for example, might have been awarded in fiscal 1960 but the last payment might not be made until the structure was finally accepted in 1962, after it had been in daily use for several months.

The following graph shows the money available to the Bureau of Mines in each of the last 3 fiscal years by source and by major objects

The "helium," "cooperative research," and "anthracite mine drainage" columns include balances of unexpended funds carried over from previous years.



# *Public Reports*

Bureau researchers wrote 818 manuscripts for publication, exceeding all previous records. Of these 317 were articles for technical societies, scientific journals, and similar organizations.

Bureau reports published by the Department during the year included 211 describing fundamental research; 68 describing developments of interest to industry; and 8 detailed summations of major Bureau research programs. The 3-volume 1960 Minerals Yearbook, issued during the year, contained 145 chapters.

A procedure instituted for simultaneous technical review of manuscripts speeded publication of Bureau reports. Issuance of a "Style Guide for Bureau of Mines Manuscripts" was a significant step toward helping authors improve manuscript quality. Among other aids incorporated in this guide is a list of standard abbreviations compiled after an exhaustive study of forms used by national and international organizations in abbreviating scientific and technical terms.

## *Million Saw Bureau Films*

Industry-sponsored Bureau films were shown during the year on educational television channels and in public service broadcasts on regular channels. For the first time, groups of related films were made generally available to television stations for programing on a regular series basis. These informational films in sound and color, loaned free on request to educational institutions and other organizations throughout the Nation, were shown more than 193,000 times to audiences totaling nearly 10 million. The Bureau circulated approximately 5,000 prints of films averaging about half an hour in length and covering 55 subjects. Each of these productions helped tell the story of the Nation's mineral resources and their use.

"Copper, The Oldest Modern Metal," the latest motion picture added to the Bureau's extensive film library, was selected as a Government entry in the documentary classification in film festivals abroad; other productions were selected for showing at other fairs and expositions, including the Seattle World's Fair. New Bureau motion pictures in production as the year ended dealt with helium, bituminous coal, potash, synthetic rubber, phosphorous, and the natural resources of the State of Washington.

# *Office of Oil and Gas*

## Jerome J. O'Brien, *Director*

The Office of Oil and Gas of the Department of the Interior provides advice and technical assistance in the development and coordination of Federal programs, both domestic and foreign, concerned with U.S. petroleum and gas resources and their efficient use. In performing its functions, the Office is the focal point of information for the Congress, Government agencies, and the public, and serves as an important channel of communication between Government and the petroleum and gas industries.

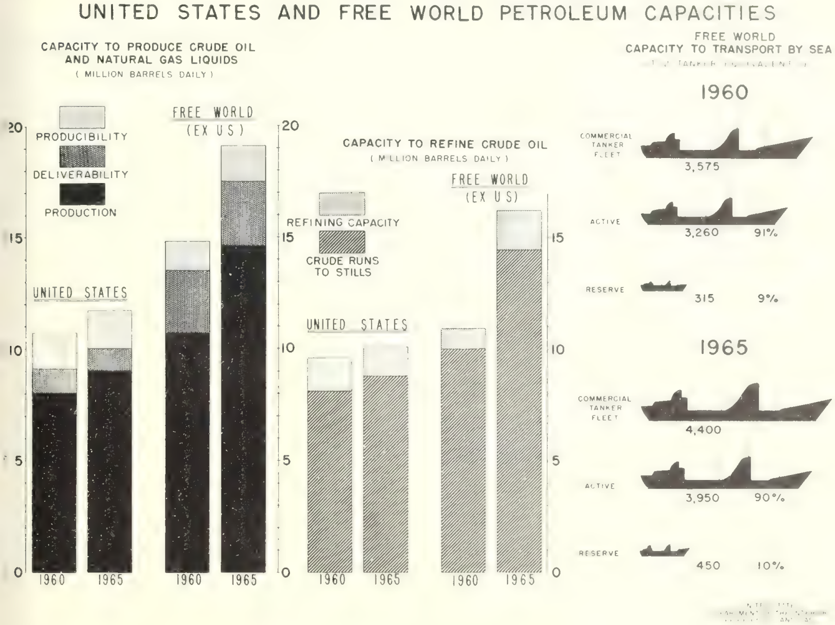
### *Strategic and Foreign Policy Papers*

A compendium of papers on strategic and foreign policy considerations of oil, prepared by the Office, was presented by the Assistant Secretary, Mineral Resources, to the Interdepartmental Committee of Under Secretaries on Foreign Economic Policy. The petroleum outlook was summarized, and topics covered included petroleum refining capacity of the free world, statistics relating to free-world petroleum supply and demand for 1960 and projected to 1965.

### *Voluntary Agreement*

Worldwide petroleum operations outside the United States have a significant influence upon operations of the U.S. petroleum industry and our Nation's defense and security programs. In view of this, the Voluntary Agreement Relating to Foreign Petroleum Supply was amended October 24, 1961, to permit establishment of a special subcommittee to meet the continuing need of U.S. defense agencies for information on petroleum requirement potentials of specific national security programs, and for technical assistance in evaluating etroleum resources available to support such plans and programs in uture emergencies.

Upon recommendation of the Office, the Petroleum Security Subommittee was appointed during the fiscal year by the Assistant ecretary Mineral Resources, as administrator of the agreement. he subcommittee is assisting the Office of Oil and Gas in preparing comprehensive classified petroleum preparedness study using ssumptions outlined by the Department of Defense. The Military Petroleum Advisory Board, which formerly carried out defense ssignments of this character, has now been terminated.



## International Activities

The Director of the Office of Oil and Gas was chairman of the U.S. Delegation to the eighth session of the Committee on Gas of the Economic Commission for Europe (United Nations), Geneva, Switzerand. The Office was also concerned with other energy matters in he ECE and took part in the formulation of the U.S. position.

This Office was represented on the U.S. delegation to the NATO Petroleum Planning Committee in Paris. The Office has been esponsible for drafting papers germane to formulation of U.S. etroleum policy in relation to NATO planning and has participated n all phases of Federal petroleum planning in this field.

Similar responsibilities were discharged for the U.S. delegation to meetings of the Oil Committee of the Organization for Economic Cooperation and Development (OECD).

Extensive information appraising the competitive position of Canadian oil exports into this country was developed by the Office as background for bilateral discussions between U.S. and Canadian Government representatives.

## *National Petroleum Council Activities*

The petroleum and gas industries are called upon by the Government for advice and facts on current trends in the petroleum and gas industries.

This work is carried on chiefly by the National Petroleum Council, which has in preparation reports on: (a) The effects on the free world of the exports of petroleum from the Soviet Bloc; (b) Capacities and precise locations of crude oil and petroleum products pipelines and gas transmission lines and their pumping or compressor stations, as well as an inventory of inland waterway barges, tank trucks, and tank cars; and (c) The productive capacity of petrochemicals made in plants owned or operated by petroleum and gas companies.

## *Civil Defense Planning*

As a continuing function, the Office carries on oil and gas civil defense planning for the United States and is establishing an executive reserve unit of selected personnel whose services will be available during any national emergency.

Guidance was given to State and industry personnel for their civil defense planning, and regional mobilization representatives carried out assignments in five of the eight Office of Emergency Planning regional areas.

## *State, Industry and Public Activities*

The Director represented the Department at the June 1962 meeting of the Interstate Oil Compact Commission, as well as by direct staff contact with officials of the States' regulatory agencies. The Director also reviewed the interdependence of free world nations on their petroleum supply at several annual meetings of industry groups during the fiscal year.

Many individual requests for information from Members of Congress, congressional committees, the general public, private companies, Federal and State agencies, and petroleum representatives of foreign governments, are answered daily.

Among the tasks performed during the fiscal year were the development of technical studies and reports for the Department of Defense. Basic information, concerned with capabilities of petroleum and gas facilities, availability of petroleum products and gas and estimates of requirements, were compiled for use of the Office of Emergency Planning. The Interagency Petroleum Study Committee on crude oil and residual fuel oil import problems received technical assistance and voluminous data in carrying out its mission. Advice was provided to the Department of Commerce on export controls of oil equipment and petroleum technology.

# *Office of Minerals Exploration*

**George Fumich, Jr.,** ***Director***

Public interest in the exploration assistance program conducted by the Office of Minerals Exploration of the Department of the Interior reached a new high in fiscal 1962 with 121 applications received and 20 new contracts executed authorizing $1,452,650 in exploration work. This increased interest is largely attributable to the addition of six mineral commodities, including gold, silver, and iron ore, to the list of commodities eligible for exploration assistance, by amending the OME regulations on July 27, 1961 (26 F.R. 6714). Other sections of the regulations were changed at the same time to simplify filing procedures.

## *Program Functions*

The Office of Minerals Exploration, under Public Law 85–701, conducts a program for the discovery of domestic mineral reserves, excluding organic fuels, by providing financial assistance to private industry on a participating basis.

The OME also administers projects certified as discoveries or developments remaining from the program of the Department's former Defense Minerals Exploration Administration under the Defense Production Act of 1950, as amended.

Under the OME program, financial assistance is available to applicants who normally would not undertake the exploration at their sole expense under current conditions or circumstances and who are unable to obtain the funds needed for the exploration work from commercia sources on reasonable terms.

The OME enters into contracts with qualified applicants to explore for one or more of the mineral commodities listed in the OME regulations. Under these contracts the Government will pay one-half the approved cost of the exploration work but not in excess of $250,000 on any single contract.

Funds contributed by the Government are repaid by a 5 percent royalty on any production during the progress of the exploration work; and if the Secretary certifies that production may be possible as a result of the exploration, the royalty obligation continues until the Government's contribution is repaid with interest, or for the 10-year period usually specified in the contract. The royalty payment applies to both principal and interest, but it never exceeds 5 percent. The contractor is not obligated to produce, nor is the Government obligated to purchase any production. If nothing is produced, there is no obligation to repay.

### *Lead and Zinc Stabilization*

Under Public Law 87–347, October 3, 1961, the Secretary is authorized and directed to establish and maintain a program of stabilization payments to small domestic producers of lead and zinc ores and concentrates. Responsibility for initiating this program was assigned to the OME.

The authority for operating this program was delegated by the Secretary to the Administrator of the General Services Administration on April 19, 1962, but the Secretary retained the budgetary and reporting functions.

The regulations for the program were agreed to by the Secretary and the Administrator on April 26, 1962. These regulations were published in the Federal Register early in the fiscal year 1963 when funds for the program were appropriated.

## *OME Operations*

During fiscal 1962, 121 applications requesting financial assistance in exploration estimated to cost a total of $12,785,000, were received. This brings the total to date for the OME program to 260 applications for exploration estimated to cost in excess of $22,505,000. These applications requested assistance to explore for 28 mineral commodities in 26 states. Actions taken on them are shown in the following table:

*Disposition of OME applications*

| Action | Number | |
|---|---|---|
| | Fiscal year 1962 | [illegible] |
| Received | 121 | [illegible] |
| Denied | [illegible] | [illegible] |
| Withdrawn | [illegible] | [illegible] |
| Contracts executed | [illegible] | [illegible] |
| Pending on June 30, 1962 | [illegible] | |

The 20 OME contracts executed during fiscal 1962 brought the total executed to date to 51. A total of 24 contract amendments also were executed in fiscal 1962 and 6 contracts were terminated or canceled, bringing the totals to date to 63 and 21, respectively. Two certifications of possible production under the OME program were issued in this fiscal year. Royalties on production totaling $9,492 have been received during this same period, increasing royalties received to $13,942. Contract actions are shown in the following tabulation:

*Summary of OME contract data*

| Contracts | Fiscal 1962 | | | Program through June 30, 1962 | | | | |
|---|---|---|---|---|---|---|---|---|
| | Number | Total cost | Government participation | Number | Total cost | Government participation | | |
| | | | | | | Approved | Spent | Repaid |
| Executed as amended | 20 | $1,452,650 | $726,325 | 51 | $2,803,086 | $1,401,543 | $406,119 | $13,942 |
| Certified as possible production | 2 | 47,300 | 23,650 | 2 | 47,300 | 23,650 | 16,381 | 10 |
| Terminated, not certified | 4 | 115,790 | 57,895 | 16 | 417,880 | 208,940 | 89,966 | 67 |
| Canceled | 2 | 110,280 | 55,140 | 5 | 199,110 | 99,555 | ------ | ------ |
| In force as of June 30, 1962 | ------ | ------ | ------ | 28 | 2,138,796 | 1,069,398 | 299,772 | 13,865 |

# DMEA Operations

The last three projects operating under DMEA contracts were certified as discoveries or developments during fiscal 1962, bringing the total number of certified projects to 399. The recoverable mineral commodities found on these 399 projects are estimated to have a value of approximately $1 billion at current market prices. During this fiscal year, royalties totalling $369,524 were received from DMEA projects, bringing the total royalties received to date under this program to $4,323,610. Seventy-one projects have repaid in full the $2,158,619 contributed by the Government. Actions on DMEA contracts are shown below.

*Summary of DMEA contract data*

| Contracts | Fiscal 1962 | | | Program through June 30, 1962 | | | | |
|---|---|---|---|---|---|---|---|---|
| | Number | Total cost | Government participation | Number | Total cost | Government participation | | |
| | | | | | | Approved | Spent | Repaid |
| Executed as amended | ------ | ------ | ------ | 1,159 | $56,770,493 | $34,805,244 | $23,347,872 | $4,323,61 |
| Certified as discoveries | 3 | $793,030 | $396,515 | 399 | 30,347,376 | 18,634,520 | 14,943,086 | 4,148,02 |
| Terminated, not certified | ------ | ------ | ------ | 677 | 24,177,658 | 14,802,234 | 8,404,786 | 175,58 |
| Cancelled | ------ | ------ | ------ | 83 | 2,245,459 | 1,368,490 | ------ | ------ |

# *Office of Minerals Mobilization*

## William E. S. Flory, *Director*

The Office of Minerals Mobilization operates under the supervision of the Assistant Secretary, Mineral Resources, and has the responsibility for planning and programing to provide an adequate supply of metals, minerals and solid fuels to meet both the civilian and military requirements under partial and full mobilization, and for Departmental nonmobilization activities and programs in metals, minerals and solid fuels as assigned by the Assistant Secretary.

Shortly after the end of the fiscal year, the Office was renamed The Office of Minerals and Solid Fuels and was given additional responsibilities and functions.

The Office also represents the Department on the Interdepartmental Materials Advisory Committee on stockpiling matters, on the Supplemental Stockpile Advisory Committee for Barter on acquisitions of materials by barter, and on the Interdepartmental Committee on the Soft Coal Industry, and performs the staff work for the Department on metals and minerals export control matters for the Operating Committee of the Advisory Committee on Export Policy.

During fiscal 1962, the Office kept under constant surveillance the supply of metals, minerals and solid fuels from all sources and their availability under any emergency condition. A close watch is continually maintained of industry and market developments that might significantly affect the estimates of supply under mobilization conditions.

In June 1962, agreement was reached between the Secretary of Commerce and the Secretary of the Interior on the stages of minerals processing and types of minerals facilities to which their respective emergency preparedness and mobilization responsibilities pertain

Mobilization base studies were completed on iron ore and mercury. Other comprehensive studies included a report on the status of the Arizona asbestos procurement program, forecast of production of Jamaican bauxite, review of the domestic beryl purchase program, review of lead and zinc stocks, results of the enactment of the Mexican mining law, reveiw of the Mexican lead-zinc industry, free-world tin position for 1961–62, and a tin price study. Staff analyses were made on the state of the domestic mining industry for chrome, fluorspar, manganese, molybdenum and tungsten. Two revised evaluations were made of high-temperature and special-property materials. Industry Evaluation Board analyses were completed on manganese and sulphur.

## *Defense Preparedness*

During the period under review members of the OMM staff participated in a series of Regional Emergency Planning Conferences held in each of the eight OEP Regions to explain the Comprehensive Program for Survival of Government and Management of Resources developed by OEP. OMM staff developed specific information for inclusion in a planning guide for the emergency management of the survival items for which this office is responsible. The Office also revised the form used for executing memoranda of agreement with the States regarding the operation of the emergency solid fuels plan to conform with the new OEP concept for the emergency management of resources at the State and local level.

The OMM continued to assist OEP in the national resources evaluation program by assembling, coding and maintaining current input data on metals, minerals and solid fuels for use in computing machines for assessing surviving resources and industrial facilities in the event of an enemy attack.

The recruitment of industry officials to serve in the OMM unit of the National Executive Reserve was accelerated during the fiscal year.

## *Stockpiling*

The OMM actively participated in the review of the principles and policies of the stockpiling program, requested by the President early in 1962.

The Office continued to advise OEP on the stockpiling of strategic and critical materials and on disposals of surplus Government inventories.

## *Office of Geography*

**Meredith F. Burrill,** *Director*

The Office of Geography provides research and other staff services for the interdepartmental Board on Geographic Names and the Secretary of the Interior in the field of foreign geographic nomenclature.

In 1962 the Office placed major emphasis on the revision and enlargement of gazetteers and name files, on the improvement of systems for deriving names from non-roman-alphabet writing systems, and on extension of international cooperation in geographic name standardization. More than 280,000 names were processed according to approved policies for standardization by the Board for Venezuela, Iceland, Southern Vietnam, Gabon, Cameroon, the Republic of Congo, the Central African Republic, Chad, Spanish Guinea, São Tomé e Príncipe, Finland, Austria, Pakistan, and the Sudan. The romanization of Greek, Amharic, Hebrew, Burmese, Cambodian, and Siamese received special attention. A joint name-standardization project was initiated with Kenya, and research on Antarctic names was intensified under a new project.

The identity and classification of named features continued to be a matter of primary interest.

## *Board on Geographic Names*

**Edward P. Cliff,** *Chairman*

**Meredith F. Burrill,** *Executive Secretary*

The interdepartmental Board on Geographic Names was established in 1947 to provide a central authority for standardizing geographic names for use by the Federal Government. It is composed of representatives of the Departments of the Interior, State, Army, Navy Post Office, Agriculture, Commerce, and Air Force; the Governmen Printing Office, the Library of Congress, and the Central Intelligenc Agency. The Secretary of the Interior acts conjointly with th Board in achieving name standardization and provides staff facilitie and maintains the records of the Board and its Committees. Foreig names staff functions are performed by the Office of Geography domestic names functions by the Geological Survey.

In 1962 the Board and its standing committees took appropriat actions to establish or modify nomenclature policies and to standardize the foreign and domestic geographic names required by th Federal Government. Through its staffs it maintained inquirie services providing official names and names information also to th general public. The Board's Advisory Committees on Antarcti Names and on Arabic and Persian continued active in their fields o special interest.

# *Office of Coal Research*

## George A. Lamb, *Director*

The Office of Coal Research, created in 1960 by Public Law 599 of the 86th Congress, is now executing and administering a forward-looking research and development program following the guidelines laid down by the Congress. As defined by the statute itself, research means scientific, technologic, and economic research, and the practical application of that research as well.

By the end of fiscal year 1962 the Office's first contract, a study to determine the potentialities for sizeable new uses of coal, had been completed, and seven additional contracts obligating all funds appropriated are currently in effect.

## *Function of OCR*

The functions of the Office of Coal Research as stated in Public Law 599 are to—

(1) develop through research, new and more efficient methods of mining, preparing, and utilizing coal;

(2) contract for, sponsor, cosponsor, and promote the coordination of, research with recognized interested groups, including but not limited to, coal trade associations, coal research associations, educational institutions, and agencies of States and political subdivisions of States;

(3) establish technical advisory committees composed of recognized experts in various aspects of coal research to assist in the examination and evaluation of research progress and of all research proposals and contracts and to insure the avoidance of duplication of research; and

(4) cooperate to the fullest extent possible with other departments, agencies, and independent establishments of the Federal Government and with State governments, and with all other interested agencies, governmental and nongovernmental.

The mission of OCR is to exploit the full potentiality and versatility of this abundant energy and chemical resource to the maximum welfare of the United States. The Office of Coal Research is devoting its efforts to enlarge and increase the use of coal within presently known fields of utilization and in addition to seek new uses for which coal is economically and technologically suited.

The establishment of the Office of Coal Research as a separate agency within the Department of the Interior permits full development and maximum control of a research program designed for expeditious commercial results—at the same time avoiding conflict with the programs of the Bureau of Mines and assuring the coordination of the two research efforts.

### *Industry-Government Cooperation*

The Secretary of the Interior has a General Technical Advisory Committee of 20 members to advise him and the Office of Coal Research on the development and direction of the program. Committee representation includes leaders among the coal producers, railroads, electric utilities, educational institutions, labor, and manufacturers of equipment.

One meeting of the full committee was held in fiscal 1962. In addition, other meetings and conferences were held with individual members or segments of the GTAC for the purpose of judging the technical and economic merits of research proposals and to aid OCR in assessing and acting upon specific problems.

## *1962 Contract-Research Program*

The seven contracts executed during fiscal 1962, all in progress at the end of the year, are briefly described in the following listing alphabetically arranged by name of the contractor.

### *Bituminous Coal Research, Inc.*

This contract has as its objective the development of processes and methods to prepare, transport, and use pulverized ultrafine coal falling in the range of 5 to 74 microns. If successful, this development will create an entirely new commodity since finely ground solids exhibit many properties normally associated with fluids. Such materials can be pumped and handled like fluids in simple items of equipment.

The ease and convenience of handling can introduce coal in many markets which are currently not available to it. Likewise, finely ground coal can be used in many processes and areas of interest such as gasification, liquefaction, and chemical manufacturing in their various forms. An additional potential exists in removal of undesirable impurities from coal such as ash and sulphur. Successful development of this potential may well have a significant effect on coal preparation plant practice and air pollution control by coal users.

## *FMC Corporation*

The contractor will conduct both bench and pilot plant scale experiments to determine the technical feasibility of extracting from coal a crude oil suitable as a diluent for a refinery feed stock. The contractor will also conduct experimental work on a multiple fluid bed and a high-temperature pyrolysis process, or a combination, to produce a pumpable synthetic crude oil which can be used to transport the remaining fuel constitutents (char) of the coal to a market located some distance away. The contractor's effort will utilize processes which have not been previously investigated. The project has the primary objective of maximizing the fluid oil yields and a yield of up to 80 gallons per ton of coal is believed an attainable goal.

## *General Electric Company*

This project includes bench scale experimentation and process development work to determine the feasibility of up-grading coal by reacting it with hydrogen. The hydrogen will be subjected to electrical discharge to increase its reactivity and simplify the process of introducing additional hydrogen into the chemical compounds which constitute coal. A new and unique process which appears to have great economic and technical promise for the production of chemicals and synthetic fuels is being studied.

## *Georgia Institute of Technology*

This project is concerned with a determination of the compounds which may result by reactions of coal or coal compounds with various other materials in a plasma jet. Plasmas of various gases will be considered and reactants, such as hydrogen; ammonia; halogens; etc., will be introduced and the resulting products will be analyzed.

## *The Ralph M. Parsons Company*

This contract is concerned with an accelerated pilot plant development program for a process utilizing new process methods and a new catalyst for manufacturing gasoline and related chemicals and char from high-volatile bituminous coal. The work will include a detailed feasibility study followed by a pilot plant design, construction, and operation program to determine overall process technology, and economics. This pilot plant is to be along a process line that is different from past approaches. Details on the confidential aspects of the new processes will be available if feasibility is favorably determined.

### *Pope, Evans & Robbins*

This is a contract for the development and design of a totally new, completely integrated, coal-fired industrial heating plant of an intermediate-size range (10,000 to 60,000 pounds of steam per hour).

Numerous new concepts for coal handling, combustion, ash and fly ash collection will be developed and evaluated. Prototype components of the package unit will be constructed and tested prior to the development of the complete final design of the overall system. All elements of the system will be so integrated and refined as to produce a compact, safe, automated and efficient installation designed to prove economically attractive to the owners of industrial establishments.

### *Virginia Polytechnic Institute*

The contractor will develop scientific engineering methods for determining the most favorable combination of the various elements of mining which can be controlled by the mine operator. By applying the scientific methods and formulae developed under this contract, a coal operator will be able to modify his system of mining and use of operating supplies to insure lowest cost production under the physical conditions existing in his underground coal-producing sections or face areas. VPI will conduct mining engineering, industrial engineering, and operations research to develop mathematical models, formulae, and programs which can be quickly solved by computor techniques, and will make them available on a nonprofit basis to any interested party having a legitimate business or academic interest.

### *Completed Contracts*

The first contract of OCR was awarded to Booz-Allen and Hamilton and was completed in the spring of 1962. It provided for a comprehensive study of the market potential for coal. Entitled "Survey of Opportunities To Stimulate Coal Utilization," two volumes, it was printed and is distributed through the Office of Technical Services, U.S. Department of Commerce.

For fiscal 1962, the Office of Coal Research operated on a total budget of $1,940,000, including $1,000,000 appropriated by the Congress and a carryover of $940,000 from the previous year when organization of the Office was still in progress.

# *Oil Import Administration*

## J. Cordell Moore, *Administrator*

The Secretary of the Interior, pursuant to Presidential Proclamation 3279, dated March 10, 1959, established the Oil Import Administration within the Department and issued regulations for the operation of an oil import program.

The objective of the oil import program is to insure a stable, healthy petroleum industry within the United States capable of exploring for and developing new domestic petroleum reserves.

In administering the program, the Oil Import Administration:

1. Analyzes data prepared by the Department's Bureau of Mines relating to petroleum demand in the United States, by commodity type and petroleum districts, in order to set the overall amounts of crude and unfinished oil, and finished petroleum products to be allowed into the United States and Puerto Rico.

2. Establishes equitable semiannual oil import allocations for individual eligible oil importers by product type and district, other than residual fuel oil (which is on an annual basis), and issues import licenses.

3. Maintains continuous evaluation of the methods for establishing oil import levels, individual import allocations and programs for exchanging foreign oils for domestic oils and initiates positive action for correcting apparent deficiencies, prepares and compiles necessary backup data for justifications and submits recommendations for changes.

4. Analyzes monthly reports from each importer showing the amount and disposition of petroleum imports entering the Nation under license and issues public reports concerning the oil import situation and the administration of the program.

5. Analyzes all exchange agreements of foreign crude and unfinished oils and domestic crude and unfinished oils.

6. Issues letter authorization to Collector of Customs to permit entries without an import license of small quantities of crude oil, unfinished or finished products.

7. Attends hearings which are conducted by the Oil Import Appeals Board to consider petitions submitted by established and would-be importers for modifications or grants of allocations and submits such written comments as are deemed appropriate and beneficial in each case.

8. Responds to an increasing volume of requests for information concerning the administration of the program from Congress, the press, foreign governments, other governmental agencies, and the public.

## *Summary of Activities*

During fiscal 1962, the Oil Import Administration issued 2,175 licenses for importation of crude petroleum and its derivatives to eligible importers according to commodity type.

Prior to the close of the fiscal year, the Administrator announced overall oil import levels for the allocation period July 1, 1962 through December 31, 1962, and issued individual oil import allocations to 192 eligible importers, for crude oil and finished products other than residual fuel oil to be used as fuel. For the allocation period April 1, 1962 through March 31, 1963, individual import allocations were issued to 45 eligible importers of residual fuel oil to be used as fuel.

Prepared and promulgated 3 amendments to the oil import regulations, making changes within the broad policy of the existing Presidential proclamation which involved adjustments in the method of allocating crude oil, unfinished oils and residual fuel oil to be used as fuel.

Received and processed over 6,000 reports from importing firms submitted in compliance with section 18 of the oil import regulations. Extracted and tabulated oil import data from these reports for statistical and administration purposes. Prepared 20 detailed documents, which were released to the public, showing oil import facts on an individual company basis by importing areas and including refinery and terminal "inputs" of crude oil and residual fuel oil respectively. Prepared and released semiannual bulletins on total oil imports listing the country of origin of all imports and the percentage ratio each exporting country shares in the U.S. oil import market.

Received, analyzed and recorded 525 "exchange agreements" covering planned action by authorized crude oil importers to exchange foreign oil for domestic oil for processing in their own refineries. This type of exchange is permitted under the oil import program subject to restrictions and provisions set forth in the oil import regulations. Analyses of these exchange agreements are necessary to assure regulation compliance.

Pursuant to section 8 of the oil import regulations, prepared and forwarded 133 letters of authorization to Collectors of Customs granting approval for small quantities of foreign oil to be entered without an import license. Authorization requests are received covering individual cases and are evaluated and acted upon on the basis of facts presented in each case.

Pursuant to an invitation extended by the Chairman of the Oil Import Appeals Board, dated April 10, 1962, the Oil Import Administration submitted detailed written comments to the Board on petitions for modifications of allocations which the Board has entertained.

# *Office of the Administrative Assistant Secretary*

**D. Otis Beasley,** *Administrative Assistant Secretary*

The Administrative Assistant Secretary in discharging the duties of the Secretary for administrative management directs and supervises seven staff divisions: administrative services; budget and finance; inspection; management research; personnel management; property management; and security.

## *Administrative Services*

The Division of Administrative Services furnishes staff guidance for all administrative services programs and activities of the Department, and operates these services for all units of the Department in the Washington metropolitan area. Workload in all operations increased sharply during the year with the normal growth of regular programs and the establishment of the Bureau of Outdoor Recreation.

Events deserving of particular mention were (1) expansion of Department central library services to field employees and offices and increased use of translated foreign language materials, (2) disposal of 1,600 cubic feet of obsolete records and the resultant release of three rooms of office space for reassignment, (3) increase in use of Department Museum facilities by more than 40 percent, with approximately 100,000 visitors during the year, and the preparation and presentation of a special "true or false" display on the differences between genuine handmade and imitation Indian art work and jewelry, (4) assumption of full accounting and budgeting duties for funds transferred to the

Department for the Area Redevelopment Administration, and preparation of an accounting manual for approval of the General Accounting Office, and (5) development and issuance of the "Employee Information Bulletin" which keeps employees advised of their rights, benefits and privileges, as well as other information requiring distribution to all personnel.

## *Budget and Finance*

The Division of Budget and Finance has primary staff responsibility for the budget and financial activities of the Department. This includes accounting systems, financial policy, internal audit policy, review of internal audit and General Accounting Office audit reports, financial reporting and budgeting. The Division represents the Department in these fields in liaison with the General Accounting Office, Bureau of the Budget, Treasury Department, and other Federal departments and agencies, and appropriation committees of the Congress.

During the past year the Division completed a review of the financing of Water Resources Division, Geological Survey and with staff of the General Accounting Office and Geological Survey, devised a simplified method of financing the Division's operations. Assisted the Bureau of Indian Affairs in simplifying allotment accounting at the agency level.

Assisted power agencies in making modifications in the chart of accounts to comply with FPC revised accounting procedures which were effective July 1, 1961.

During the year, the Division reviewed and appraised the findings and took action as necessary on 68 General Accounting Offices audit reports, 162 internal audit reports rendered by bureaus of the Department, and 30 investigative and inspection reports.

The budget activities for the year included the processing of two regular budgets; one for the Bureau of Reclamation and power marketing agencies, and one for the other bureaus, in addition to supplemental appropriation budgets.

## *Inspection*

The Division of Inspection is responsible for the inspection and investigative activities of the Department. The purpose of the inspection program in the Department is to insure high ethical standards in the management and administration of the Department's affairs.

The inspection effort is directed to assist positive management so that areas of probable employee difficulty may be identified prior to employee involvement. In this regard, the objective of the inspection program is to develop and maintain at all organizational levels a systematic inspection activity by means of which effective standards of ethical conduct may be promoted.

The Division of Inspection has responsibility for Departmental handling of matters under the President's Equal Employment Opportunity policy, enunciated in Executive Order 10925, dated March 6, 1961. Regulations approved by the President's Committee on Equal Employment Opportunity, placing the Department's program into effect, have been issued to all personnel of the Department; and an equal employment opportunity poster was prepared and is now displayed on the bulletin boards of the operating offices designating Equal Employment Policy Officers.

## *Management Research*

Continuing improvement in the conduct of the operations of the bureaus and offices of the Department and in their management is the primary objective of this division. Projects assigned to its management analysts during the past year attest to the scope of the division's activities.

Examples are: Management analysis and recommendation on the organization of the Department for Emergency Preparedness; survey of program and administrative relationships among the Bureau of Commercial Fisheries central office and its regional offices and their subordinate field installations, including study of the adequacy of the staffing of the regional offices and the Bureau's headquarters research management staff; study and implementation of the organization and management aspects of the establishment of the new Bureau of Outdoor Recreation; review of organization and procedures for contracting for research and development work by the Office of Saline Water; comparative study of bureau employment in the Washington metropolitan area; organization and management study related to the mplementation of the Interior-Army agreement in Alaska; study of the correspondence control system of the Department.

The Branch of Incentive Awards provided assistance to the bureaus and offices in their suggestions, work accomplishment, and other ncentive awards activities. There has been a slight downward trend n the number of suggestions received; however, increases have been noted in the average dollar amount of awards given and the number of superior performance and special acts or services awards granted.

For the seventh consecutive year the Department of the Interior ncentive Awards Program evidenced quality suggestions from its employees by adoption of 33 percent of the total number of suggestions received. The average adoption rate over the past seven years was 34.5 percent which was much higher than the entire Government average over that period. The average award paid during the 1962 fiscal year for each adopted suggestion also reached a new high, $44.19. The average award paid for Superior Performance and Special Acts or Services Awards was $232, an increase of $24 over the 1961 fiscal year.

The following statistics reflect the 1962 fiscal year activities of the incentive awards program:

| Cash awards: | | Cash awards: | |
|---|---|---|---|
| Suggestions | 1168 | Valor | 6 |
| Superior Performance | 1158 | Meritorious Service | 135 |
| Special Acts or Services | 158 | Commendable Service | 543 |
| Distinguished Service | 25 | | |

## *Personnel Management*

The Division of Personnel Management has primary staff responsibility for the development of policies and programs to establish and maintain an adequate qualified and efficient working force in the Department.

Executive Orders 10987 and 10988 were of signal importance to the Department since they had a direct effect on employee management relations, grievances, disciplinary actions and employee appeals. All related policies and procedures previously issued by the Department were reviewed, revised and rewritten to conform with the provisions of the two Executive Orders.

The increased interest in conservation work resulted in the publication of an eleven page booklet entitled "Information on Competitive Sub-professional Employment in Conservation". A concentrated study was conducted of the voluntary resignations and transfers on the part of our permanent work force. Reasons for quitting were analyzed. Percent of quits by age groups and length of Federal service were studied. The resignations were broken down by the main professional groups within the Department and various other related facts were collected.

Data was collected from all bureaus on methods used to overcome the shortage of qualified persons in the field of science and engineering through increasing skills of present employees, thorough utilization of professional skill and the development of new procedure for accomplishing scientific and engineering work without increasing the professional staff.

In line with the President's intent to maintain the Federal career service free from discrimination on the basis of sex, the Department's personnel practices were reviewed and instructions issued to assure compliance to the policy.

An appraisal of Departmental management training in the Department of the Interior was made during the year. The appraisal was conducted for the first 10 groups of the Junior Management Training Program and for the first 3 groups of the Departmental Manager Development Program.

For the 6th consecutive year since the establishment of a Department safety organization in 1955, the frequency rate of work injuries has decreased. The rate is presently at a new low of 8.4 disabling work injuries for each million man-hours of exposure, contrasted with a rate of 14.3 in 1955.

## *Property Management*

The Division of Property Management has primary staff responsibility for all property management activities of the Department.

Contracting and purchasing activities of the bureaus and offices continued to be directed toward compliance with the Department's policy for advancing economic benefits to labor surplus areas and small business firms. Measures were taken in several areas of activity to effectively promote and implement Executive Order 10925, ~~for~~ the expanded program of employment and advancement without discrimination.

A Memorandum of Understanding was executed with the General Services Administration under which that agency will assume responsibility for conducting sales of most of the surplus personal property generated by bureaus of this Department.

The Department's policies on board of survey action were revised to simplify survey procedures and to reduce the paperwork involved in granting relief from accountability for relatively low cost items. During the year, personal property acquired at a cost of more than $600,000 and no longer needed in Department programs was donated to public schools and hospitals through the donable property program administered by the Department of Health, Education, and Welfare. To provide more effective and timely controls and prevent accumulation of unnecessary files, emphasis was directed to:

1. Improvement of the reporting system.
2. Realistic review of existing records control schedules and reduction of overly liberal use of "indefinite" and "permanent."
3. Full utilization of available technical services of the National Archives and Records Service.

## *Security*

The Division of Security has primary responsibility for the establishment and maintenance of security throughout the Department. The Division also has the assignments for Departmental direction and coordination of the radiological defense training program and coordination of activities under the Federal Disaster Act of 1950.

The radiological defense capability of the bureaus and offices of the Department has continued to advance at a satisfactory rate with the number of trained instructors and monitors increasing. In addition, the Department has the responsibility for establishing monitoring network under the jurisdiction of the Office of Civil Defense, Department of Defense. These stations serve a dual purpose; they are regular installations of the Department of the Interior, and also serve a part of the Federal network.

# *Office of the Solicitor*

## Frank J. Barry, *Solicitor*

The Office of the Solicitor performs all legal work for the entire Department. In addition to the legal work directly concerned with the programs and activities of the Department and its bureaus, the Office of the Solicitor handles matters relating to torts and other claims, inventions by personnel of the Department, and appeals to the Secretary in public land proceedings and Indian probate matters. The Board of Contract Appeals within the Office decides appeals under contracts by the bureaus and offices of the Department.

The number of matters considered in the Office of the Solicitor continued at a high volume with approximately 64,000 hours spent giving oral advice and attending conferences and meetings. Appeals in land cases reached a record high of 651 far surpassing the prior year's record number of 480.

A thorough review was undertaken of the legislative history of the patent provisions of the Saline Water Act of 1962 (Public Law 87–295), the Coal Research Act (Public Law 86–599) and the Helium Act Amendments of 1960 (Public Law 86–777) to determine the intent of Congress as to inventions arising out of Government-financed research and development work. The results of this study were set orth by the Solicitor in his opinion of May 7, 1962 (M–36637) holding that patents arising out of Government-financed research under such acts must be made available without cost to the public.

### *San Luis Decision*

In an opinion of December 26, 1961 (M–36635), the Solicitor held hat lands in the State service area of the San Luis Unit, Calif., whose will be served through the joint Federal-State facilities are not subject to the excess land limitations of Federal reclamation law but lands in the Federal service area are subject to such limitations.

The Solicitor, in an opinion of December 26, 1961 (M–36634), helc that early payout of the construction charge obligation does not relieve excess lands of the limitations of Federal reclamation law. Negotiations for repayment contracts on the Kings River and Kern Rive projects are well advanced.

This Office assisted in the development and execution of the permit program initiated in the summer of 1961 to bring under control the extensive trespasses along the Lower Colorado River. To date the greater portion of the estimated 1,000 trespassers have been placed under permit and are paying full rental value for their occupancy The balance are in process of negotiation and execution. Full Federa control should be accomplished by December 1962.

On September 27, 1961, the Congress consented to the Delaware River Basin Compact establishing a four-State river basin commission with full Federal participation, to undertake comprehensive planning and development of the populous Delaware River Basin. The Compact and the commission established thereunder are unique in joint Federal-State relationships. The Solicitor coordinated and represented Federal departments and agencies in working out the provisions of consent legislation to protect all Federal interests, and carry out the objectives of the compact.

In connection with the helium conservation program of the Burea of Mines, contractual commitments to accept early delivery of crud helium extracted from natural gas at privately owned plants require prompt acquisition of easements for about 400 miles of pipelines i Kansas, Oklahoma, and Texas. Within a period of 6 months, al preliminary legal work necessary for construction operations wa finished, including contracts for construction and acquisition b purchase or condemnation of required pipeline rights-of-way.

## *Court Decisions*

On June 28, 1962 the U.S. Court of Appeals for the District o Columbia Circuit in the actions entitled *Udall* v. *Wisconsin, Colorad* and *Minnesota* (No. 16,669) and *Udall* v. *Michigan* (No. 16,670) upheld apportionments by the Secretary of Federal aid funds unde section 4 of the Pittman-Robertson Act (16 U.S.C. 669c) on th basis of the number of individuals who bought one or more huntin licenses, contrary to the contention of the States that such apportionment should be on the basis of the number of licenses sold.

The Supreme Court of New Mexico, on June 5, 1962, affirmed th decision of the State District Court that Navajo Indians residing o the portion of their reservation within New Mexico were eligible t vote in the State's elections. *Montoya* v. *Bolack*, 372 P. 2d 387. At the outset of this election contest the Secretary of the Interior filed a brief as *amicus curiae* in support of the Indian right to vote. In rejecting the contestant's argument that the Navajos were not New Mexican residents for voting purposes, the Court found that the decision of the United States Supreme Court in *Organized Village of Kake* v. *Egan,* 369 U.S. 60 (March 5, 1962), went far to clarify and resolve the issues in the voting case.

In *Boesche* v. *Udall,* No. 16,238 in the U.S. Court of Appeals for the District of Columbia Circuit, the court en banc on June 15, 1962, on rehearing, adopted the judgment of a division of the court, entered on November 16, 1961, sustaining the Secretary's authority to cancel administratively oil and gas leases issued on defective applications. This ruling is in conflict with the ruling of the 10th Circuit in *Pan American Petroleum Corp.* v. *Pierson,* 284 F. 2d 649.

In *Louise Safarik et al.* v. *Udall,* No. 16,646 (June 7, 1962), the Court of Appeals for the District of Columbia Circuit sustained the authority of the Secretary, in changing his interpretation of a statute, to give his new interpretation prospective effect only. The decision of the court in effect validated thousands of partial assignments of oil and gas leases approved under the old interpretation.

## *Contract Appeals*

In a case of first impression, *Weldfab Incorporated* (68 I.D. 241), the Board of Contract Appeals held that the revised Changes Clause of Standard Form 32 for supply contracts (October 1957 Edition), permitting equitable adjustment concerning contract work not changed, in addition to work directly changed by a change order, does not apply to the contractor's expenses during a standby period while the contractor is awaiting the issuance of the change order. Such expenses could be recovered only under an appropriate Suspension of Work provision, which was not included in the contract.

The Board of Contract Appeals denied two motions for reconsideration of its decision in *Merritt-Chapman & Scott Corporation* (68 I.D. 1). The Comptroller General furnished an advance decision (B–142040, April 2, 1962) as to propriety of payment of a voucher for increases in labor costs, pursuant to a wage escalation clause in the prime contract for construction of Glen Canyon Dam as to one group of workers (five basic crafts), holding that after careful consideration of the evidence before the Board, there was no adequate basis for questioning the Board's decision. There is pending with the Comptroller General another request for advance decision concerning the payment of increased labor costs of other employees (electricians),

## *Office of the Legislative Counsel*

### Max N. Edwards, *Assistant to the Secretary and Legislative Counsel*

The volume of work handled by the Legislative Counsel of the Department's Office of the Solicitor is large. During the 87th Congress, the Department was asked by various committees to report on a total of 1,601 bills. Reports were prepared on 1,304—81.44 percent of the total. In addition, the Department initiated and drafted 218 proposed bills for submission to Congress by Executive communication and reviewed and commented upon 72 proposed bills initiated by other departments.

The total number of public laws enacted by the 87th Congress and approved by the President through October 17, 1962, was 838. The Department prepared reports on 290 of them, 34.60 percent of the total.

The total number of bills introduced in the 87th Congress was 17,337. The Department maintained legislative histories on 3,147 of them (18.15 percent), and partial records on an additional 566 (3.26 percent).

The Legislative Counsel's office coordinates the preparation of all legislative materials in the Department, except appropriations, and the testimony of Departmental witnesses before the various Congressional committees. Some of the more important laws enacted by the 87th Congress in the field of natural resources and conservation were laws authorizing the start of three new major reclamation projects (the $171 million Fryingpan-Arkansas in Colorado and the San Juan Chama and Navajo irrigation projects in New Mexico, with a combined cost of $220 million); an expanded water desalinization program; laws creating three national seashores for addition to the National Park System (Cape Cod on the Atlantic Coast, Padre Island on the Gulf Coast of Texas, and Point Reyes on the Pacific Coast north of San Francisco); a law authorizing an expanded program of wetlands acquisition which will make possible the establishment of widespread new waterfowl refuges and the acquisition of title to or easements on approximately 2 million acres of land; a law providing effective sanctions for the enforcement of an international tuna conservation program.

In addition to the enacted legislation, a major effort was made on a series of important bills that were considered by the 87th Congress and were the subject of extended debate and discussion, and that will undoubtedly be further considered by the 88th Congress. These included an extensive and farsighted program of outdoor recreation, including new methods of financing; a far-reaching 5-

ear conservation plan for the 467 million acres of public lands ad-
inistered by the Bureau of Land Management; the transportation
f coal "slurry" by pipeline; a wilderness bill to preserve in its original
tatus for the benefit of present and future generations some of our
windling natural resources; a pumped-back storage plan which
ses cheap off-peak energy to pump water to high elevations for
ter release to generate hydroelectricity at hours of peak consump-
on; the expansion of the Indian credit program to stimulate economic
evelopment of the underdeveloped Indian reservation areas; a pro-
ram to improve public works, health, education, shipping and trans-
ortation, and to stimulate self-government in the United States
erritories of American Samoa, the Virgin Islands, and Guam, and in
he Mandated Trust Territory.

# *Resources Program Staff*

## Charles H. Stoddard, *Director*

The Resources Program Staff in the Office of the Secretary of th Interior performs two major functions: Central staff and departmenta coordination.

As central staff, Resources Program Staff assists and advises th Secretary, Under Secretary, and other secretarial officers in th development and initiation of departmental policy and in the forma tion of long-range program objectives. It also handles a variety special assignments. The Staff also carries on a coordinating ro for several of the departmental functions which range across th lines of the individual bureau operations and which are coordinate at the departmental level.

This coordinating activity centers around five areas of regular ar continuing responsibilities. The Staff works to coordinate the bureau activities in these areas along the lines of departmental policy ar objectives and to coordinate the Department's operation with th of other Federal agencies. These areas of continuing responsibili and their significant activities during the past fiscal year follow:

## *Program Planning Coordination*

A departmental system of long-range planning and programi was launched in April 1962. The Secretary directed the Staff assist the Under Secretary in heading this operation by establishi criteria, projections and procedures for cooperative programmi with the Bureaus. Preliminary departmental program plans f soil and moisture conservation, forestry, and range conservati have been assembled.

## *Area Redevelopment Coordination*

The Staff has led and correlated the Department's participation in the area redevelopment program in planning for immediate and long-range projects with the bureaus in areas of chronic unemployment or underemployment where water, minerals, forestry, recreation, fish and wildlife play a major role.

## *International Activities Coordination*

The Staff continued its work of coordinating the Department's interests and responsibilities in minerals, fisheries, and other resource product fields as affected by U.S. participation in the General Agreement on Tariffs and Trade (GATT). The Staff provided representation on U.S. delegations to the meetings of the contracting parties of GATT and several of its committees at meetings held in Geneva, Switzerland. The Staff also provided departmental support for the administration's Trade Expansion Act of 1962.

## *Field Committee Coordination*

The Staff coordinates the Department's regional field activities through its six field committees whose chairmen are members of the staff. The field committees function to coordinate bureau programs within their regions, reconcile overlapping and conflicting problems, identify and develop project and program plans and provide liaison with other Federal departments on interagency committees.

## *Resource Economics*

The Staff economist develops long-range resource projections for program planning, carries out special economic studies (credit, public works, etc.), inventories current resource statistics and acts to correlate current resource economics research.

## *Special Major Assignments*

Additional major Staff functions included interagency leadership on river basin planning in the development of new policies, standards, and procedures for the formulation, evaluation and review of plans for Federal water and related land resource projects. New standards were approved by the President on May 15, 1962, and then became effective for use by the four departments and the Bureau of the Budget. In addition, the Staff provided services with respect to negotiations with the States involved in the legislation granting Federal consent to the Delaware River Basin Compact.

The Staff assisted the Secretary in development of a comprehensive Federal outdoor recreation program, which resulted in the establishment of the Department's Bureau of Outdoor Recreation, proposed legislation for Federal grants to stimulate recreation planning by the States, and financing for Federal acquisition of recreational lands through a Land Conservation Fund. Overall leadership was given the Staff in planning and programing the White House Conference on Conservation in May.

# *Office of the Science Adviser*

## Roger Revelle, *Science Adviser*

The role of science in policy matters of the Department has received continued attention from the Science Adviser since establishment of this departmental post early in year 1962. In this, the Science Adviser has served as a consultant to the Secretary, Under Secretary, and Assistant Secretaries on the Department's natural-resource research programs. He has studied particularly needs for new research to meet changing national and world conditions. This recognizes the importance of science and technology in present day world affairs.

The great need for increased water resources and problems resulting from irrigation of arid lands have been dominant both nationally and internationally. In this regard, the Science Adviser served as the chairman and scientific leader on a White House-Interior Panel which studied waterlogging and high salinity which are spoiling agricultural lands in West Pakistan. On another scene, but closely related to this problem, was consultation on increased salinity of Colorado River drainage into Mexicali Valley, Mexico.

Coordination of science throughout Government has been enhanced by increased activities of the Federal Council for Science and Technology. The Science Adviser has represented the Department on the Federal Council and has served as chairman of the Council's Committee on Natural Resources. This committee has carried out extensive studies on biological, energy, land, mineral and water resources.

Scientific matters which concern several bureaus of the Department are represented by the Science Adviser where cooperation is needed with other agencies within and outside the Government. Examples of these activities are the U.S.-Japan Committee on Scientific Cooperation

tion, Advisory Committee to the Department of State on Antarctic Affairs, cooperation with the National Science Foundation on research programs of the Organization for Economic Cooperation and Development, and numerous tasks with the Agency for International Development.

Practical applications of solar energy have been studied in cooperation with the National Academy of Sciences-National Research Council. A first study has shown that solar energy could be beneficial to arid regions and to lesser developed areas as a source of power for small refrigeration units and for electrical generating plants. Development of solar energy will be a subject of future consideration by the Science Adviser for the Department.

In summary, the Science Adviser has had as a special goal the proper balance and growth of research programs of the Department to implement recommendations of the President's special message on natural resources. This has been done with the realization that an investment in research today to develop and protect natural resources will pay generous dividends in future years.

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U.S. DEPARTMENT OF THE INTERIOR

March 3, 1849

# Annual Report 1963

U.S. DEPARTMENT OF THE INTERIOR
MARCH 3, 1849

# THE SECRETARY OF THE NTERIOR

Stewart L. Udall

1963

*Annual Report*

THE SECRETARY OF THE

# INTERIOR

STEWART L. UDALL

*For the Fiscal Year Ending June 30, 1963*

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March 3, 1849

THE SECRETARY OF THE INTERIOR
WASHINGTON

DEAR MR. PRESIDENT: Transmitted herewith is the 1963 annual report of the Department of the Interior.

On President Kennedy's late fall conservation tour of the United States he quoted Robert Frost's remark: "What makes a nation in the beginning is a good piece of geography." He went on to pay tribute to this good piece of geography that is America, but as both you and he have emphasized what is important is what the people of America do with it.

There is little we can do in the field of conservation today that will materially alter our lives in the next 3 or 4 years. But we can build today for the 70's, just as those great men with distance in their eyes built for us, back in the early part of this century.

Science must become the servant of conservation. It is our responsibility to the future to generate a third great wave of conservation which will be a worthy successor to the forward thrust supplied by the two great Roosevelts—to devise new programs that will enable us to preserve this green environment which means so much to us all.

True conservation, in the final analysis, is something of the mind. It is an ideal of men who cherish their past and believe in their future.

In our perpetual search for abundance, beauty and order, we manifest both our love for the land and our sense of responsibility to future generations. The inheritors of a pastoral America made sure that this legacy was preserved in great part for us today. We must develop a conservation ethic that encompasses the entire relationship of man to his environment, that stresses the unity of all our resources, that recognizes the live-and-help-live basis of the great chain of life.

Only thus can we fulfill our responsibilty to the land and to the future; only thus can we sustain the hope of opportunity, progress and security for continuing generations.

Sincerely yours,

Stewart L. Udall

STEWART L. UDALL,
*Secretary of the Interior.*

THE PRESIDENT,
*The White House.*

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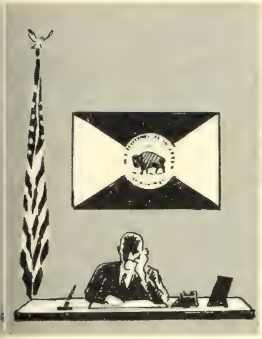
# Office of the Secretary of the Interior

Stewart L. Udall, Secretary

James K. Carr, Under Secretary



# Office of the Secretary of the Interior

## Stewart L. Udall, Secretary

## James K. Carr, Under Secretary

The Secretary of the Interior—as head of a major executive department of the Federal Government—serves as a member of the Cabinet of the President of the United States and the principal Federal executive officer charged with the administration of programs to conserve and to develop the natural resources of the United States.

The Secretary—assisted by the Under Secretary—directs and supervises the activities of the 24 bureaus and offices of the Department of the Interior. The Under Secretary, with the exception of certain actions requiring the personal attention of the Secretary, has the full authority of the Secretary on any matter which comes before him.

The responsibilities of the Secretary include:

. . . **Management** of some 553 million acres of public-domain lands and mineral leasing responsibilities for all other federally owned lands, as well as on the Federal areas off the coasts of our Nation.

. . . **Marketing** of electric power from plants with an installed capacity of about 13.6 million kilowatts, derived from federally constructed water, and flood, and navigational projects.

. . . **Providing** irrigation water for about 8 million acres of

hasta Dam, a key feature of the Central Valley Project in California, [illegible] n the north for irrigation, flood control, municipal and industrial use, [illegible] nd recreation.

agricultural lands in the arid and semiarid West which, for the most part, produce high-quality nonsurplus foods and fibers worth $1.2 billion annually.

. . . **Exercising** Federal trust responsibilities for about 350,000 Indians, working constantly to improve the natural and human resources of the Indians.

. . . **Administration,** economic improvement, social and political betterment in the remaining territorial areas of the United States—Guam, American Samoa, the Virgin Islands and the United Nations-mandated Trust Territory of the Pacific.

. . . **Increasing** the mineral and fuel potentials of the Nation by assisting technically—and in the case of strategic minerals financially—in developing and improving mining methods and geologic knowledge, and by promotion of conservation through wise utilization of our mineral and fuel resources.

. . . **Protecting** and administering almost 200 nationa parks, monuments, and historic sites, and creating new recreational areas at multipurpose water resource projects—as wel as making public lands available for recreational needs t States and municipalities and providing planning aids t States. The various recreational lands and areas of the Department are visited by over 125 million Americans annually

. . . **Promoting** the conservation and development of our vita sport and commercial fish populations and natural wildlif resources and protecting these resources from unnecessary depletion and wasteful use.

. . . **Surveying** the water and mineral resources of the Nation for present and future needs and providing for the basi geologic and topographic mapping of the Nation.

. . . **Directing** and coordinating the national effort to achiev the economical conversion of the waters of the oceans and brackish water into fresh water for human use.

In addition, the Secretary also exercises delegated defense mobilization responsibilities related to minerals, fuels, electric power, and commercial fisheries.

As the principal conservation agency of the Federal Government, the Department of the Interior is engaged in activities which dail affect the lives of all Americans. The term, "Interior," is actuall a misnomer—the Department might be described more accuratel as a department of natural resources.

Representatives of the Department are at work today around the globe. Employees are engaged in resource conservation activities in every State of the Nation, in our few remaining territorial areas, in the major oceans, at the north and south polar regions, and by invitation in more than a score of foreign countries. The Department has major responsibilities in the international field, particularly in foreign trade affecting minerals, fuels, and fishery products.

The Department receives annual appropriations from the Congress. The Department also returns substantial revenue to the Federal Treasury and to the States from its resource conservation activities.

In recent years, the appropriation of the Department for all purposes has been slightly under $1 billion, and its income from resource conservation and development activities has been about 55 to 60 percent of its appropriations. The annual investment in resource conservation by the Department continues to create new wealth and to generate new income each year throughout the Nation far beyond the cost of Federal expenditures.

In formulating and administering programs for the management, conservation and development of natural resources, the Department pursues the following objectives: The encouragement of efficient resource use; the assurance of adequately developed resources to meet the requirements of national defense and an expanding economy; the maintenance of productive resource capacity for future generations; the promotion of equitable distribution of the benefits of publicly owned resources; the discouragement of wasteful exploitation; and the orderly incorporation of Indian groups into national life by providing equal educational and economic opportunity.

In the following pages, the programs of the Department during fiscal 1963 designed to meet these responsibilities and objectives are described.

# Office of the Assistant Secretary Public Land Management

John A. Carver, Jr., Assistant Secretary

# Office of the Assistant Secretary Public Land Management

## John A. Carver, Jr., Assistant Secretary

A program Assistant Secretary in the Department of the Interior must bring the Secretary's policy direction to bear, and make decisions, on the issues presented by the programs under his jurisdiction; and he must perform the liaison involved in securing public, political, and congressional acceptance of those policy decisions. As in any dynamic organization, the number and complexity of such issues seem never to diminish. As the Public Land Management bureaus enter fiscal year 1964, their workload is no less than it was a year previous. Progress can be claimed, however, in the fact that many of the pending issues are new ones and a substantial number that were on the agenda as fiscal 1963 opened have been resolved satisfactorily.

A major center of attention involved the fixing of a more reasonable price for the forage which the public lands furnish to the western livestock industry. Effective March 1, 1963, the fee structure for each animal unit month was increased slightly more than 50 percent. Despite small pockets of vigorous dissent, this was accomplished with the general acquiescence of responsible range users and defended in extensive hearings before Congress.

Largely due to the sympathetic cooperation of the Congress, also, a vexatious problem of long standing was resolved when Public Law 87–851 provided an equitable formula for regularizing unauthorized residential occupancy of invalid mining claims. Close cooperation between industry and Government and among [illegible] Government agencies permitted the beginning of a program to

Managed under a program of multiple-use, public lands offer mineral wealth, productive forests, grazing lands, wildlife habitat, and recreation opportunity for hunting, fishing and camping.

orderly salvage of millions of board feet of timber downed by the savage onslaught of a Pacific Northwest storm. Failure in this respect would have threatened the economy of a whole region and exposed a valuable resource to inestimable damage from pest infestation and fire. Systematic attack on the backlog of soil and water conservation work was started through substantial increases in appropriations, to be concentrated in designated project areas where improvements can be measured in businesslike fashion.

Two major units were added to the National Park System with the creation of Point Reyes and Padre Island National Seashores. Major land acquisition efforts and funds were concentrated on Cape Cod so key tracts might be made available for public use at the earliest date. Three congressional committees focused their attention on the concessions management policies followed by the Park Service. To meet the various issues raised, these policies have been restated, looking toward legislative restatement. On a day-to-day basis, continued acceleration of the number of park visits and use and conflicts between the pure preservationist philosophy and the need for intensive development to meet public demand posed problems demanding immediate decisions. A committee of eminent scientists and wildlife management experts formulated a broad program for effective husbandry of this resource.

Congress enacted a legislative charter for the Bureau of Outdoor Recreation, created by Executive action the previous year. The Bureau immediately undertook the major projects for which it was created: securing enactment of legislation to establish a fund for supporting expanded National and State recreation development programs and developing standards, policies, and criteria to serve as the basis for a national recreation plan. The Bureau also was assigned the responsibility for finding solutions to a series of highly controversial issues which had hampered full development of recreation potential over long periods of time, including the Northern Cascades area, Flaming Gorge Reservoir, the Allagash region, Assateague Island, and future policies for the management of free-flowing streams in various parts of the Nation.

Developments affecting the Indian people of the Nation were less dramatic and not as sharply defined as in the other areas of responsibility. While Congress devoted extensive time and attention to some of the major policy issues which block full development of Indian resources—material and human—no major legislative enactments were forthcoming. The gross lag in educational and employment opportunities continues as the major deterrent to Indian advancement. The substantially increased appropriations provided by the Congress have permitted an expanded effort to close the gap, but the process is and will continue to be a methodical one whose results will be felt only over a period of years. Individual problems of tribal organization, distribution of tribal assets, law and order under local jurisdictional laws, and treaty rights have had to be treated as separate parts of a broad complex.

The administration of territorial affairs was marked by a sharp change in policy regarding one area, a period of marking time on progress toward increased self-government in others, and the need for emergency measures to aid in the recovery of Guam from natural disaster.

Congress doubled the limitation on appropriations for the Trust Territory of the Pacific Islands. This action, and the actual appropriation which followed, gives meaning to a policy commitment that our relationship to the people of Micronesia should be converted from that of mere passive custodianship to one of positive assistance in raising educational, health, economic, and overall social standards to a level commensurate with those existing in the rest of the world. Efforts to confer upon the American citizens of Guam and the Virgin Islands greater latitude to manage their own affairs and elect their own leadership did not bear fruit in 1963.

However, the framework for such a shift in national policy is fully developed and at year's end was before Congress for its further consideration. Overshadowing these developments, however, was the crushing blow dealt the island of Guam by successive typhoons. While loss of life and serious personal injury was gratifyingly low, property damage and destruction of public facilities created extreme hardship and a heavy impact on the local economy. Emergency measures by the military departments, Office of Emergency Planning, the Red Cross, and other agencies enabled Guam to reestablish normal activity after a relatively short period. However, permanent reconstruction requires capital investment far beyond local capability to finance. In close cooperation with local officials, this Department has assumed the responsibility for securing assistance in the form of Federal grants and loans.

# Bureau of Indian Affairs

## Philleo Nash, Commissioner

Early in the 1963 fiscal year—on August 2, 1962—President Kennedy received at the White House the first group of 10 Indian and Eskimo young men from Alaska who had completed an 18-month course of electronics training in New York City under auspices of the Bureau of Indian Affairs and who were headed for high-paying jobs in their native State. Ten months later—on June 7, 1963—the U.S. Supreme Court finally settled a decades-old controversy between the Navajo and Hopi Tribes over the ownership of a 2,500,000-acre rectangle in northern Arizona.

These were two of the outstanding events of the period in the field of Indian affairs and both had important economic implications.

The Alaskan trainees were, in a sense, a pioneer group—the first in what may eventually be a long line of Indians and Eskimos from the northernmost State who take an intensive course of electronics instruction in preparation for jobs at defense and communications installations in the far reaches of their native land. Their visit to the White House was one of the most interesting phases of the adult vocational training program which the Bureau of Indian Affairs began in 1958 and which has equipped thousands of Indians from reservations in the older States with marketable job skills.

Training for natives of Alaska was carried out under an agreement between the Bureau and the Radio Corp. of America. Under its terms the first contingent was trained at the RCA Institute in New York City; subsequent groups have been and will be enrolled at the similar institute in Los Angeles, Calif. Training now

The first 10 Alaskan natives to complete the 18-month RCA electronics training program are shown being received by President Kennedy prior to reporting for employment on communications.

is being financed partly by BIA funds and partly by the Department of the Air Force, which contemplates employment of those trained under its auspices. At year's end, 10 more Alaskans had completed training at the Los Angeles Institute and were entering jobs in the satellite and space exploration program at the new data acquisition facility which RCA Service Co. is operating under contract for the National Space and Aeronautics Administration at Fairbanks. Twenty-five others were still in training at Los Angeles; 40 additional were scheduled to enroll and about 20 others were slated to begin training in February 1964.

The Supreme Court's action of 1963 affirmed the decision reached in the fall of 1962 by a special three-judge court established under a 1958 congressional law to adjudicate the Navajo-Hopi controversy. At the center of the disagreement was a reservation set aside from the public domain by Executive order of the President in 1882 "for the use of the [Hopi] and such other Indians as the Secretary of the Interior may see fit to settle thereon."

The litigation revolved largely around the Navajo Tribe's contention that the major portion of this area is, in effect, part of the surrounding Navajo Reservation since many Navajo tribal members have been settled there over the years with the implied approval of the Secretary of the Interior. As long as tribal ownership of the land remained in contention, economic development of its mineral and other potentialities was necessarily limited.

In its decision of September 28, 1962, the three-judge court ruled that the Hopi Tribe has exclusive interest in and to that part of the 1882 reservation lying within the boundaries of Land Management District No. 6 as defined in 1943. The area thus awarded to the Hopi Tribe embraces about 500,000 acres and includes all the principal Hopi settlements. It was conceded to be Hopi territory by the Navajo litigants.

As for the remaining part of the Executive order reservation, embracing about 2 million acres, the Court determined that both the Hopi and Navajo Tribes "have joint, undivided and equal interests" in and to this land and joint rights of use.

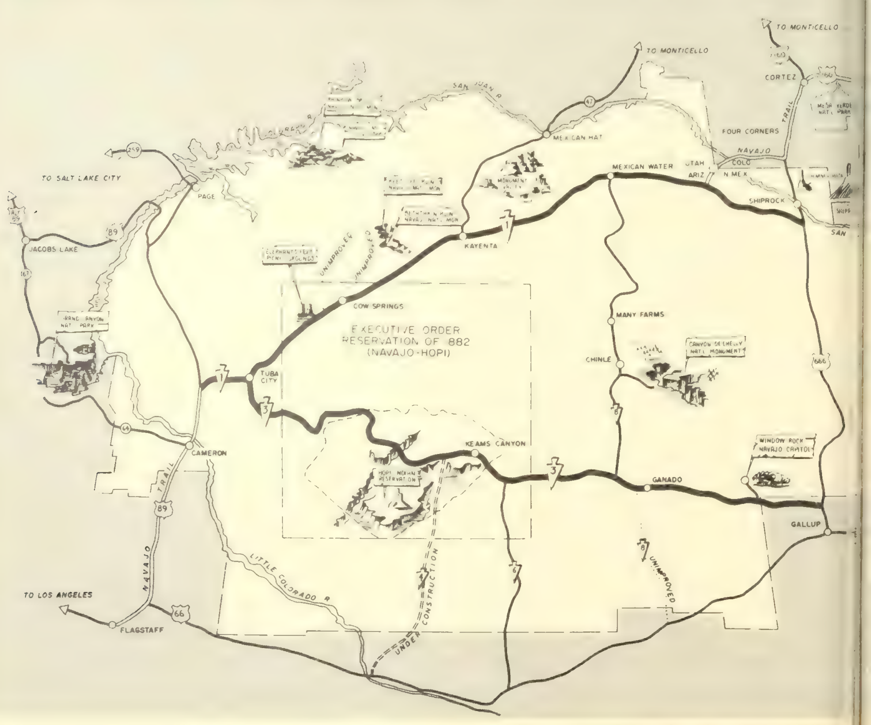
"It will now be," the Court concluded, "for the two tribes and Government officials to determine whether, with these basic issues resolved, the area lying outside district 6 can and should be fairly administered as a joint reservation. If this proves impracticable or undesirable, any future effort to partition the jointly held area, by agreement, subsequently-authorized suit, or otherwise, will be aided by the determination in this action of the present legal rights and interests of the respective tribes."

Representatives of both tribes and of the Bureau of Indian Affairs were to meet at Phoenix, Ariz., in August 1963, to explore the problems involved in administration of the area as a "joint reservation."

Another noteworthy development took place in June 1963 when the Department complied with a request of the San Carlos Apaches and restored to tribal ownership the subsurface or mineral rights in an area of roughly 225,000 acres in eastern Arizona known as the "San Carlos Mineral Strip." The lands were originally part of the San Carlos Apache Reservation, but were ceded to the United States in 1896 with the understanding that proceeds from disposing of the tracts under the mineral land laws would be credited to the

Indians. Since 1932, however, the area has been withdrawn from all forms of public entry. Recently interest has been shown in the copper and other mineral potential of the lands. Restoration of the mineral interests to the tribe will open up the area for development and should be beneficial both to the Indians and to the State of Arizona.

Apart from these events, the Bureau of Indian Affairs in fiscal 1963 continued emphasizing greater development of human and natural resources on Indian reservations in line with policies recommended by the 1961 Task Force on Indian Affairs. Work was pushed on construction projects that will add thousands of classroom seats to the BIA school system, especially on the Navajo Reservation and in Alaska. Summer programs for students in BIA schools were expanded and increased attention was given to improving English-language teaching and other types of classroom instruction. More Indians than in any previous fiscal year were provided with vocational training through the combined operations of BIA's program in this field and the training projects ap-


Navajo Highways 1 and 3 with Main Points of Interest - Navajo Reservation

These new school buildings at Crownpoint, N. Mex., on the Navajo Reservation, comprise one of 38 projects in school construction completed by the Bureau of Indian Affairs in fiscal year 1963 to provide more classroom and dormitory space for the steadily increasing Indian population.

proved for Indian communities by the Area Redevelopment Administration.

Work was completed on two major roads spanning the Navajo Reservation and linking it up with other principal highways of the Southwest.

Projects launched under the Accelerated Public Works Program on nearly 100 reservations provided useful work for thousands of tribal members and contributed importantly to the protection and development of Indian timber stands and other physical resources. A new industrial plant, expected to provide jobs for some 200 workers, began operations during the spring on lands of the Laguna Pueblo in New Mexico and negotiations were underway seeking establishment of several additional plants that further will broaden employment opportunities for residents of other reservations.

# EDUCATION AIDED

When school construction funds are added to those for operation and maintenance of BIA's farflung school system, it becomes apparent that nearly 60 percent of the Bureau's total appropriations in any recent fiscal year has been for purposes directly related to education. Improved education is essential for accomplishing the more comprehensive BIA goals of maximum Indian economic self-sufficiency, full participation of Indians in American life, and equal citizenship privileges and responsibilities for Indians.

## School Construction Gains

One of the principal educational objectives of the Bureau is to provide a physical plant—embracing classrooms, dormitories, and all related facilities—that will include sufficient space to accommodate, without overcrowding, all Indian children who cannot feasibly be educated in non-Bureau schools. A second and closely related purpose is to replace structures that have become obsolete or hazardous to health with modern, safe, and sanitary facilities.

The Bureau entered the 1960's with a substantial backlog of needs for expanding and modernizing buildings in its far-reaching school network. These needs were particularly acute on the Navajo Reservation of Arizona and New Mexico and in the native villages of Alaska, but were by no means confined to those localities. Complicating the problem still further was the fact of year-by-year increases in school-age populations to be accommodated in Federal facilities.

In fiscal 1963 the Bureau completed 38 school construction projects involving over 5,000 classroom seats. About half these seats were additions to the total capacity of the BIA-operated school system; the others were included in replacements of previously inadequate structures. The completed work will accommodate more pupils and will relieve serious overcrowding in many localities.

At year's end, 38 additional projects were underway. When finished, they will provide about 9,700 classroom seats. Of these, nearly 6,000 seats will be additions to the BIA-operated system and approximately 3,700 will be replacements.

## Art Institute Opens at Santa Fe

On October 1, 1962, the Bureau began operating a new Institute of American Indian Arts in Santa Fe, N. Mex. Unique in the Bureau's school system, the Institute is being established on the grounds of the Bureau's former Santa Fe boarding school and was operated on a limited basis during its first year because the boarding school continued in partial operation. Plans call for an eventual enrollment of about 500 students in the Institute; in fiscal 1963 the student body included 150 enrollees from 74 tribes in 20 States.

Courses were offered at the senior high school level and in two postgraduate years. The curriculum included a fully accredited academic program with special emphasis on the vocational implications of fine and applied arts. The postgraduate students concentrated on a major and minor field in the arts and were required to enroll in at least two academic courses related to their art studies. Specialized instruction and guidance were provided in painting, sculpture, jewelry craftsmanship, ceramics, design and printing of textiles, and creative writing. Advanced academic courses were available, at the student's expense, at a nearby college.

Results of the Institute's first year of operation were highly encouraging. Artistic works produced by the students in practically all fields won high praise from qualified experts visiting the school

tudents gain practical experience in applied art at a technical institute at Santa Fe, N. Mex., opened by the Bureau of Indian Affairs in the fall of 1962, which offers a asic high school curriculum plus 2 years of postgraduate work emphasizing the vocaional aspects of fine and applied arts.

and from the general public. Several young people who had shown little previous interest in education responded enthusiastically to the unique opportunities offered at the Institute and there were comparatively few dropouts. A large percentage of the first-year students is expected to return in the fall of 1963 and the enrollment is being planned for not more than 300. Further expansion of facilities will be required before the full complement of about 500 students can be accommodated.

## Enrollment in Summer Programs Increases

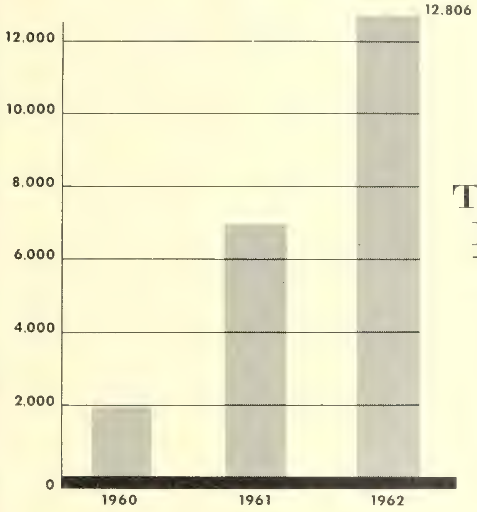
In the summer of 1962 the Bureau continued for the third year its offering of special programs designed to broaden the horizons of Indian students and contribute to their personal development. As in previous years, the summer programs were of four principal kinds: academic, student employment, organized sports and other leisure-time activities, and field trips. With the growing popularity of these programs, about 12,800 students took part in 1962; this was an increase of about 90 percent over 1961.

Preschool sessions for beginners were a feature of the academic phase. Youngsters entering school for the first time in the fall of 1962 were taken into some schools for periods up to 6 weeks. During these sessions the teachers concentrated on widening the conceptual background of these children and on teaching English.

Several branches of the Bureau concerned with the conservation and development of resources such as soils and timber have cooperated with the Branch of Education at numerous locations across the country to provide summer employment for Indian youth. The work of the students has contributed to the advancement of the resource programs and also has given the participants a greater measure of self-respect and pride in being able to earn money. These work opportunities also helped encourage many students to remain in school.

The recreational phase of the programs is aimed at teaching students how to use their leisure time constructively and thus develop a sense of the responsibilities of good citizenship. Activities included Scouting, 4–H Club work, arts and crafts, Little League baseball, softball, playground games, camping, swimming, golf, tennis, volleyball, archery, badminton, and bowling. All helped fill the summertime void for students by developing a heightened sense of fairplay and sportsmanship, fostering social adjustment in group activities, and broadening the scope of associations with non-Indians. These attitudes may well carry over into other facets of the students' lives.

## Number of Indian Children Participating in Summer Programs



### Programs

work
academic
recreation
enrichment

### Tribal Councils Participating

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San Carlos, San Felipe, Yakima,
Colorado River, Colville, Zuni,
Consolidated Ute, Laguna,
Navajo, Omaha, Sisseton,
Shoshone, Warm Springs,
White River, Winnebago,
Seminole, Uintah

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Field trips were also important. Many Indian children from reservation homes have had little or no experience outside the immediate periphery of their reservations and this deficiency is frequently reflected in the classroom achievement of the students at certain academic levels. Educational field trips helped broaden the students' horizons. The youngsters visited our larger cities, used shopping centers, and stayed in hotels and motels. In addition, they were guided to scenic and educational points of interest. They thus acquired the kind of enriching experiences most non-Indian youngsters consider commonplace. These experiences, in turn, had classroom value since they gave a new dimension of meanings to many topics discussed in their studies.

## English Emphasized as a Second Language

Because more than 80 percent of the students enrolled in BIA schools come from homes where an Indian language is spoken regularly, development of facility in speaking and understanding English is one of the most important primary tasks of the Bureau's school system. In May 1963 the Bureau concentrated attention on this task at a Washington conference of some of the country's outstanding experts on the Indian languages and their relationship to English. Consultants included Dr. George Sanchez of the University of Texas, Dr. Edward Kennard of the University of Pittsburgh, Dr. Edward Dozier of the University of Arizona, John Connelly of San Francisco State College, and Robert Young, tribal operations officer at the Bureau's Gallup (N. Mex.) area office. In a 4-day meeting with the Commissioner and his top education staff, past and present programs of English-language instruction in Bureau schools were appraised and recommendations for improvements were formulated.

As a result of the conference, arrangements were made for developing a series of tape-recorded training lessons for orienting school personnel who work with Navajo-speaking pupils. A second series of tapes is to be used in connection with other southwestern tribes. The conferees also recommended better pretraining and more thorough orientation of BIA teachers in the cultural and language backgrounds of the people they are going to teach, employing linguists to develop materials for use in language laboratories and to select vocabularies that will facilitate language learning at various grade levels, and revision of the "Minimum Essential Goals" document used in all BIA schools to reflect more accurately the Bureau's current philosophy of English language teaching.

## Demonstration School Opened

In common with public schools all over the country, the Bureau faces a serious problem in the large number of students who drop out of school before completing the 12 years considered a minimum prerequisite for adequate employment. Considerable evidence suggests that the dropout rate in Bureau schools is substantially higher than the national public school average.

To find better ways of coping with this problem, the Bureau opened a demonstration school in the fall of 1962 in two renovated cottage-type dormitories at Concho, Okla. The student body consisted of 78 youngsters who either had dropped out of school or had shown a pronounced inclination to do so. The staff consisted of highly qualified personnel whose assignment was to diagnose the individual difficulties of each student and help him overcome his education indifference and personal problems.

When a pupil reached the proper stage in terms of motivation and academic preparedness, he was transferred either to his former school or to another school believed to be better equipped to meet his individual needs.

In its 1963 education program BIA stressed the use of language laboratories for the purpose of improving English language capability. These students at the Santa Fe Institute are engaged in vocabulary studies with the most modern equipment.

At the close of the school year, 27 of the 78 enrollees were still in attendance at Concho, 32 were still in attendance at other schools to which they had been transferred during the year, and 12 were no longer in school. This represented a salvage rate of 85 percent. While the results were encouraging, efforts to curb dropouts will be increased. For the 1963–64 term, a psychologist will be added to the Concho staff to study causes of educational indifference and special services will be provided by a supervisor trained in psychiatric social work.

### Post-High-School Training Stressed

To keep pace with changes in the employment market caused by rapid advances in automation, the Bureau took additional steps in fiscal 1963 to make its high school programs less "terminal" and more preparatory for postgraduate technical or vocational training or for college enrollment. At the Haskell Institute in Lawrence, Kans., the ninth grade was eliminated to provide additional space for students seeking post-high-school training in electronics, the building trades, the service occupations, or business and commercial subjects. At the Institute of American Indian Arts in Santa Fe, 2 years beyond high school were offered to provide training in arts-related occupations. And at the Chilocco School in Oklahoma, post-high-school courses were offered in some of the distributive and service occupations.

## School Enrollment Gains

Since 1960, Bureau reports have not included the number of Indian children enrolled in the public schools of California, Idaho, Michigan, Minnesota, Nebraska, Oregon (except Warm Springs

Like other schools throughout the country, those operated by the Bureau of Indian Affair are now giving heightened emphasis to science courses. These Navajo students at the Intermountain School in Utah are learning the differences between the mythology of the rain dance and the meteorology of air masses.

Agency), Texas, Washington, and Wisconsin, because these are States where full responsibility for educating resident Indian children has been taken over by the public school system. In other States where the BIA operates, the enrollment of school-age Indian children in all schools increased 3.1 percent in fiscal 1963. Of the 121,236 enrolled, 7.7 percent were in mission and other private schools. Public school enrollment increased by 2,508 students.

The Bureau in fiscal 1963 operated 264 schools with an enrollment of 43,435 including those under 6 and over 18 years of age. This was an increase of 1,390 students, or 3 percent, as compared with fiscal 1962. In addition, dormitory facilities were provided at 20 locations for 4,082 Indian students attending public schools. Dormitory operations of this type meet unusual emergencies and do not represent a permanent pattern for educating Indians.

Apart from the regular school program, the Bureau continued offering classes on the reservations for adult residents to increase their understanding of the work around them and to upgrade their skills for earning a living.

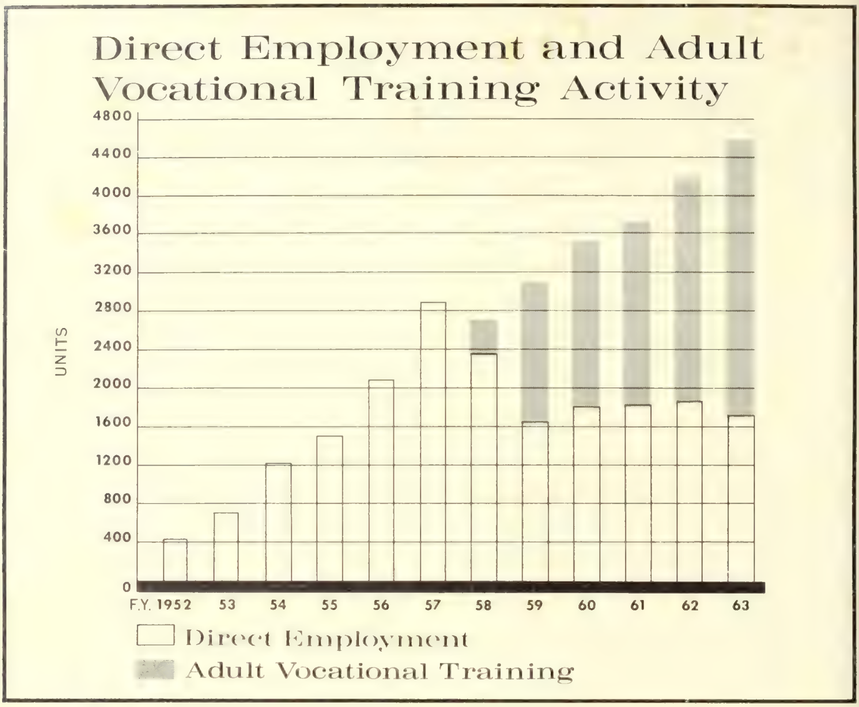
# EMPLOYMENT OPPORTUNITIES EXPANDED

With unemployment on Indian reservations across the country averaging about 40 percent and running as high as 50 or 60 percent in some areas, it was clear that upgrading of Indian skills and the creation of more local job opportunities are tasks of the highest priority for the Bureau of Indian Affairs.

In recent years the Bureau has given increased attention to this problem. In fiscal 1963 the attack was broader than ever with five distinct operations of the Bureau contributing directly to alleviating Indian unemployment. These were adult vocational training, voluntary relocation of Indians for employment in urban centers, industrial development on or near the reservations, the accelerated public works projects on the reservations, and increased use of "force account" by the Bureau in its construction. In addition, the Bureau continued emphasizing greater economic development and wider employment opportunities through its "resource" programs in the fields of forestry, range management, irrigation, soil and moisture conservation, and mineral development.

## Adult Vocational Training at Peak

Fiscal 1963 was a peak year for vocational training of Indians. During the year, 2,911 trainees were enrolled in vocational school



Direct Employment and Adult Vocational Training Activity

across the country under the Bureau's program. This was 549 more than the 1962 total, or an increase of more than 20 percent. Of the 1963 trainees, 1,164 were carried over from the previous year and 1,747 entered training. When family dependents are included, 5,047 persons benefited from the 1963 operation.

In addition, 675 Indians took part in 19 training programs of the Area Redevelopment Administration in Indian communities of 5 States, and an undetermined number of others participated in ARA training programs in non-Indian communities. Eighteen different occupations were involved in the 19 ARA Indian-community projects. An outstanding example of cooperation between BIA and ARA was the movement of 35 Indians from Arizona and New Mexico reservations to Los Angeles, where they completed a basic electronics course and then moved directly into jobs.

## Direct Employment Assisted

Relocation of Indians for direct employment in urban centers (as distinguished from relocation for purposes of vocational training) declined slightly in fiscal 1963. The total family units or unattached individuals assisted in this way was 1,696, compared with

1,866 for 1962; the total number of individuals involved was 3,318, compared with 3,494. The decrease reflected BIA's greater emphasis on vocational training as preparation for the steadier and better paying types of employment.

Apart from the relocation to urban centers, the Bureau helped an additional 2,052 family heads or unattached individuals find jobs, temporary or permanent, on or near reservations. Many had qualified for this employment through on-job training in industrial plants recently established in reservation areas.

Availability of increasing numbers of Indians with job skills has made it possible to assist more and more Indians to obtain adequate employment near the reservations and in urban centers. Employers representing many fields are becoming favorably aware of the productive ability of Indian workers, both men and women.

## Industrial Development Promoted

By the late spring of 1963, reports to the Bureau indicated that more than 500 Indians were working in industrial plants established over the past several years on or near Indian reservations. Through its industrial development program, the Bureau encourages this trend by working closely with tribal organizations and maintaining liaison with industrial concerns interested in new plant locations. In cases where the companies have programs for training workers on the job, the Bureau is in position to compensate them, under terms of a formal contract, for the cost of training Indian workers.

The most noteworthy new plant to begin operations in Indian country during fiscal 1963 was an electronics establishment on lands of the Laguna Pueblo west of Albuquerque, N. Mex. The tribal group agreed to construct a $440,000 building to house the operation and to lease it to the company. The BIA helped the arrangement in a liaison capacity and provided financial assistance through an on-the-job training contract. The plant is expected to provide jobs eventually for 200 or more Indian workers.

Arrangements were also completed in fiscal 1963 for a plant to manufacture hair curlers and similar cosmetic aids on the Cherokee Reservation in North Carolina. This will be the third industrial plant for that reservation. It is expected to employ about 200 at full operation. Under an agreement between the company and the tribe, the tribe will construct a $250,000 building to house the operation and make building and equipment available to the company under a 25-year lease. The Bureau has agreed to help through an on-the-job training contract.

By the end of March 1963 the Bureau had on-the-job training contracts with 13 industrial concerns and was financing the training of 245 Indians in their plants.

## Many Accelerated Public Works Projects Start

Under the Accelerated Public Works program, more than $12 million was allotted the Bureau of Indian Affairs in fiscal 1963. These funds permitted the Bureau to move immediately on a backlog of urgently needed public works on Indian reservations impossible to reach with regular appropriations.

Eighty-six APW projects began on Indian reservations in 18 States during the year, providing over 17,000 man-months of employment for Indians. Preference was given jobs with comparatively low costs for equipment and supplies so funds would create greatest employment. By year's end, over 5,500 Indians were working on these projects.

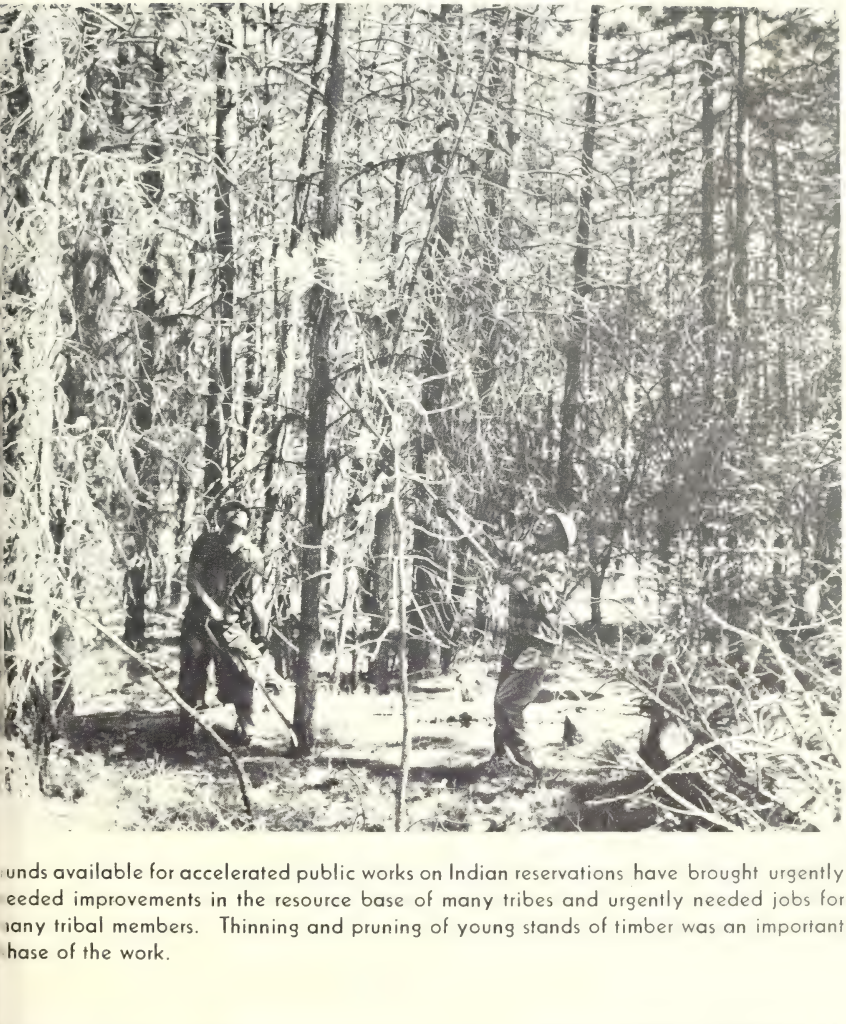
The APW projects on Indian reservations had four principal objectives: upgrading Indian-owned timber stands, conserving of soil and water, improving reservation roads, and constructing community centers.

The forestry projects were carried out under principles of sustained yield and well-balanced multiple use. They involved the thinning of overcrowded young stands to promote the growth of selected trees, pruning to produce knot-free timber of greater value, cleanup of roadsides to improve scenic values and reduce fire hazards, construction of firebreaks, and provision of campgrounds and picnic facilities.

Soil and water conservation projects were designed for local needs and conditions. One type involved the fencing of Indian rangelands to promote better use of the resource. Others were concentrated on brush eradication and range reseeding. In addition to controlling erosion, these practices will increase forage production as much as 15 to 20 times by eliminating low-grade plants that compete with the grass. Another type of conservation project, carried out on many reservations, involved the construction of smal dams to control floods and store water for livestock or recreationa use.

Road projects under the APW program ranged from improvement work on forest protection trails to complete construction and surfacing of roads serving reservations. Such work was accomplished on 88 roads totaling 651 miles on 38 reservations.

Allocation of the APW funds also made it possible for the BIA to build long-needed community centers on many Indian reserva



unds available for accelerated public works on Indian reservations have brought urgently eeded improvements in the resource base of many tribes and urgently needed jobs for iany tribal members. Thinning and pruning of young stands of timber was an important hase of the work.

ions to house tribal gatherings and promote greater cohesion of ribal populations. Nine such constructions were undertaken in laska and 14 on Indian reservations in the other States. All but hree were completed by year's end.

## Jse of Force Account Increases

There are two principal ways in which the Bureau can accomplish ieeded work in road maintenance and construction, repair and naintenance of buildings, and construction of buildings and utilities. One is by awarding a private contract; the other is through he use of "force account" which involves direct employment by the BIA and BIA supervision of the job. Experience has shown that the force account method generally creates more employment opportunities for Indians and provides them with valuable construction training.

Accordingly the Bureau adopted in 1961 the following policy for construction work:

> The force account method shall be used when justified by the employment and training of Indian workers, and where the acquisition of equipment can be justified. The contract method shall be used on projects where Indian workers are not available, or where the acquisition of specialized equipment cannot be justified.

In line with this policy, the Bureau has for the past 2 years used force account, wherever practicable, in its construction and has staffed its crews to the fullest possible extent with Indians. At the end of fiscal 1962, there were 2,847 workers employed on force account projects throughout the Bureau, compared with 1,260 in fiscal 1961. Of the 987 additional force account workers in 1962, an estimated 776, or nearly 80 percent, were Indians. During fiscal 1963, the Bureau continued emphasizing force account and was employing over 1,000 more workers on such projects at the end of the period than at the beginning. It is estimated that 90 percent of the additional jobs created were occupied by Indians.

## ECONOMIC DEVELOPMENT SPURRED

Apart from the direct employment expansion activities described earlier, the Bureau also accelerated its longer range efforts to create a more dynamic climate of economic activity on Indian reservations. In this connection, economic feasibility studies, road construction, and the financing of Indian economic enterprises were especially important.

### 26 Feasibility Studies Started

Twenty-six new studies were undertaken in fiscal 1963 to explore the feasibility of various types of economic enterprises on Indian reservations. These were in addition to the 19 such studies launched the previous year and continued in fiscal 1963. Two of the new studies were financed by the Area Redevelopment Administration and the balance by the BIA.

ndian tribes are showing an increased awareness of the possibilities for developing evenue-producing and job-creating tourist attractions on their reservations. Pyramid Lake in Nevada is one of many Indian areas which have a high potential for such development.

A large number of the studies were focused on the possibilities of developing tourist attractions to create additional jobs for reservation Indians and bring more revenue into tribal treasuries. The more important Indian areas being surveyed for such potentialities included the Pyramid Lake Reservation in Nevada, the Warm Springs Reservation in Oregon, the Allegany (Seneca) Reservation in New York State, the Big Bend Redevelopment Area embracing the Crow Creek and Lower Brule Reservations in South Dakota, the Hopi Reservation in Arizona, the Nez Perce Reservation in Idaho, and the right-of-way along the newly completed Routes 1 and 3 on the Navajo Reservation in Arizona and New Mexico.

Other major types of studies focused on the possibilities of food processing (on the Quinault Reservation in Washington and the Kotzebue area of Alaska) and on the commercial utilization of forest products (on the Blackfeet and Rocky Boys Reservations n Montana, the Wind River Reservation in Wyoming, and the Navajo Reservation of the Southwest).

## Road Construction Reaches Peak

Over the past 30 years the BIA road system has been gradually expanding and evolving into a complex transportation network on reservations in 22 States. In fiscal 1963 the system was substantially improved by construction of more miles of road than in any previous year. Roadway grading was accomplished on 475 miles of road, compared with 383 miles in 1962; all-weather surfacing was completed on 575 miles, as contrasted with 543 in the preceding period. Emphasis was on two principal objectives: the improvement of schoolbus routes and the construction of roads serving existing or potential business enterprises and tourist attractions.

## Road Building Sets Record

By the close of fiscal 1963, all the more important work was finished on the biggest road construction job ever undertaken by the Bureau of Indian Affairs. This involved the building of two prime highways, designated as Routes 1 and 3, across the Navajo and Hopi Reservations, which have a combined area roughly the size of West Virginia. A $20 million contract authorization for the two roads was provided by Congress in August 1958 and contracts totaling $2 million were awarded during the balance of the fiscal year that ended June 30, 1959. The program was completed with successive annual programs of $4 million to $5 million in the following fiscal years. All that remained to be accomplished at the end of fiscal 1963 was the widening of bituminous-surfaced sections. This work was expected to be under contract during the 1963 construction season.

The two roads come together at Tuba City, Ariz., on the western side of the Navajo Reservation. From there, Route 3 runs for 168 miles in a general easterly direction across the Hopi Reservation through Ganado, Ariz., to a point on U.S. Route 666 north of Gallup, N. Mex. Route 1 is roughly 200 miles long and proceeds in a northeasterly direction across the northwest corner of the joint Navajo-Hopi reservation through Kayenta and Mexican Water, Ariz., to a point on U.S. Route 666 south of Shiprock, N. Mex.

Prior to construction of Routes 1 and 3, State highways did not enter the Navajo-Hopi area or cross its interior. Only three of the four edges of the Navajo Reservation were served by improved State highways: the eastern side by the north-south Route U.S 666, the western border by north-south Route U.S. 89, and the

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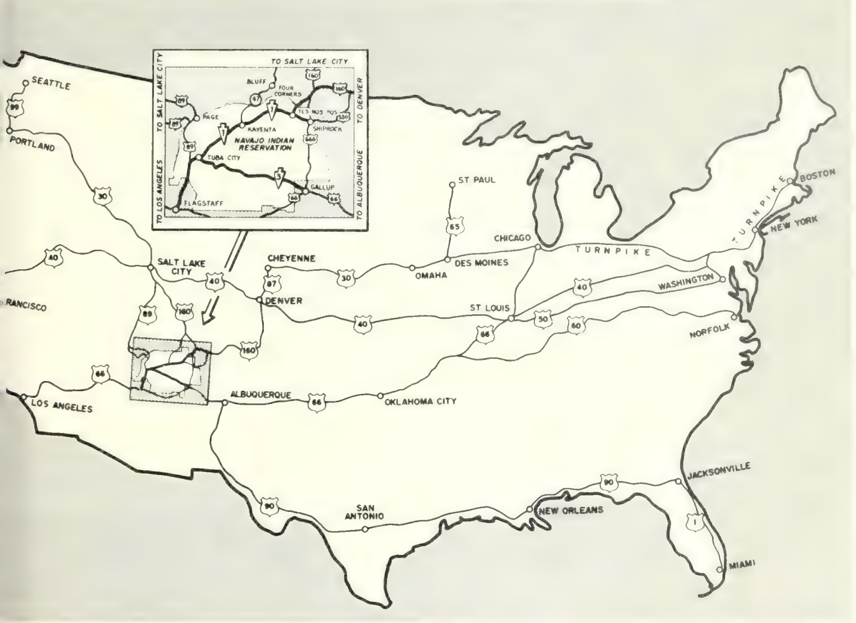
U.S. Highway System and Cities



southern edge by the famous east-west Route U.S. 66. The interior was inadequately served by a system of BIA routes ranging from trails, at the worst, to unsurfaced roads, at the best.

The prime significance of the new construction is that it opens up this vast area—with its rich scenic values and its great potentialities for economic development—to traffic moving along major highways from almost every part of the country. Both the Navajo and Hopi Tribes, as well as the U.S. public at large, should benefit greatly.

In terms of tourism, the potentialities are extremely far reaching. The Navajo-Hopi area contains many points of interest to tourists and should benefit from the growing tourist traffic now being drawn to the southwestern United States as the existence of the two all-weather routes becomes more widely known. This, in turn, will lead to a mounting demand for motels and other overnight accommodations, restaurants, camping facilities, riding and hiking trails, and guided tours of the reservation area—and to greatly increased job opportunities for Navajo and Hopi Indians. As noted earlier, a study was started in fiscal 1963 to determine the most desirable pattern of tourist-accommodation development along these two routes. It should provide the key to the types and specific locations of facilities that will prove most financially rewarding.

In addition, Routes 1 and 3 should enhance industrial development in the Navajo-Hopi area. As constructed, the two roads can handle large volumes of industrial traffic. The two reservations, taken together, have a large pool of available manpower which should become increasingly skilled as vocational training opportunities provided to Indians by the BIA and other Federal agencies are continued and expanded.

Completion of Routes 1 and 3 was unquestionably a major milestone in the centuries-old history of the Navajo and Hopi Indian Tribes; it should mark the beginning of an era of unprecedented economic growth and development in this long-neglected portion of the American Southwest.

## Credit Financing Creates Problems

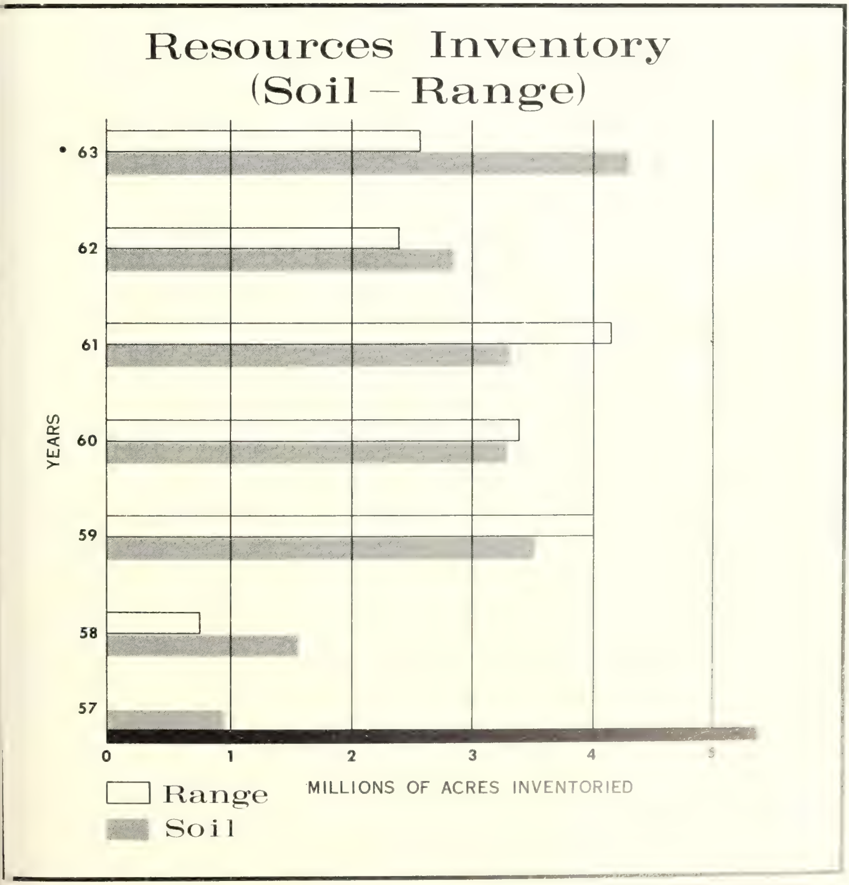
To finance a wide variety of economic enterprises on Indian reservations, ranging from individually owned livestock herds to tribally owned sawmills and motels, the Indians need credit.

For several years past, the most important source has been the banks and other lending institutions serving the general public. Indians, however, have been at some disadvantage in dealing with these lenders because of the trust and restricted status of Indian land titles and the custodial role of the Government in Indian affairs. The Bureau of Indian Affairs has a credit program; one of the chief functions is to facilitate transactions and assist Indian tribes or individual Indians obtain loans from these institutions. Success of the efforts is indicated by the fact that the financing of Indian enterprises from such sources has nearly quadrupled over the past decade, rising from $22 million in calendar year 1952 to $85 million in 1962.

A second source of Indian financing is tribal funds. Nearly $26 million of such money was being used in tribal credit programs at the close of fiscal 1962, the latest date for which comprehensive information is available. Prospects are that this source of financing will be substantially enlarged in the future in many areas as judgments are awarded by the Indian Claims Commission in compensation for tribal claims against the United States.

The revolving credit program of the BIA provides financing to Indian tribes and individual Indians in cases where loans from other sources cannot be obtained or are insufficient to meet needs.

A total of $27 million has been authorized by Congress for the BIA credit program. Of this, about $23.7 million has been appropriated. Because of the revolving nature of the fund, however, loans totaling more than $48 million have been made over the history of the program since the 1930's. Of this $30.5 million has been repaid and $236,000 has been canceled. Over the years prior to 1961, the average amount of new advances made from the fund per year was about $1.5 million; by contrast, the total for fiscal 1963 was nearly four times as great, or roughly $5.8 million. Of this, about $2 million was advanced to tribal organizations for relending to individual members; about $3.5 million was for financing of tribally owned enterprises, such as sawmills, livestock herds, pasture improvements, and the operation of salmon canneries in Alaska; and $350,000 was for attracting industries to establish plants on or near the reservations.



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# RESOURCE CONSERVATION AND IMPROVEMENT GROW

In addition to projects made possible on Indian reservations by allotment of Accelerated Public Works funds, much valuable work in resource conservation and development was accomplished during the year by the Bureau with its regular appropriations.

## Soil and Range Surveys Pushed

In the early 1950's, the Bureau started a systematic program of soil surveys on Indian reservation lands to meet mounting demands for such information in connection with farm, range, and watershed planning. In 1957 this program was expanded to include data on forage and water resources and recreational potentials of the range as well as the soils information. Since then, both range and soil surveys have progressed simultaneously. Because the surveys are made on a crop-year basis, data for 1963 are incomplete. Indications are that soil work will be completed in fiscal 1963 on some 5 million acres and range surveys on more than 6 million acres.

## Forestry Activities Increase

During the past 10 years, up-to-date inventories have been completed on all the commercially important Indian forests to provide a basis for calculating the allowable annual cut under a program of sustained yield management. On most forested reservations, the new data indicate that the annual harvest can safely be increased by 50 percent or more as compared with the level of cutting that has prevailed in recent years. On such reservations, the volume of timber harvesting will be stepped up as rapidly as funds become available to administer additional sales and as markets for the additional timber can be developed.

In fiscal 1963, cash returns from Indian timber sales increase 8 percent over 1962 and totaled over $9 million for 59 million board feet. This was accomplished despite a distresse condition in the lumber market. Indian timber sales were sufficient to build about 60,000 five-room houses.

Additionally, the 1963 harvest of Indian timber generated abou 5,000 man-years of direct employment and probably 2,000 man-years of indirect employment in service occupations as a result o the increased payrolls. About 1,500 man-years of this work was accomplished by the Indians.

## Indians' Understanding of Resources Improved

One of the major objectives of the Bureau's resource management programs is to give Indians, and particularly Indian youth, a better understanding of the lands and other physical resources held in trust for them by the United States and to instruct them in the proper care of these assets.

One example of this is the land judging school which has become an annual event on the Cherokee Reservation in North Carolina. As many as 12 teams from high schools in 5 counties of western North Carolina participate in these yearly contests, held under BIA auspices.

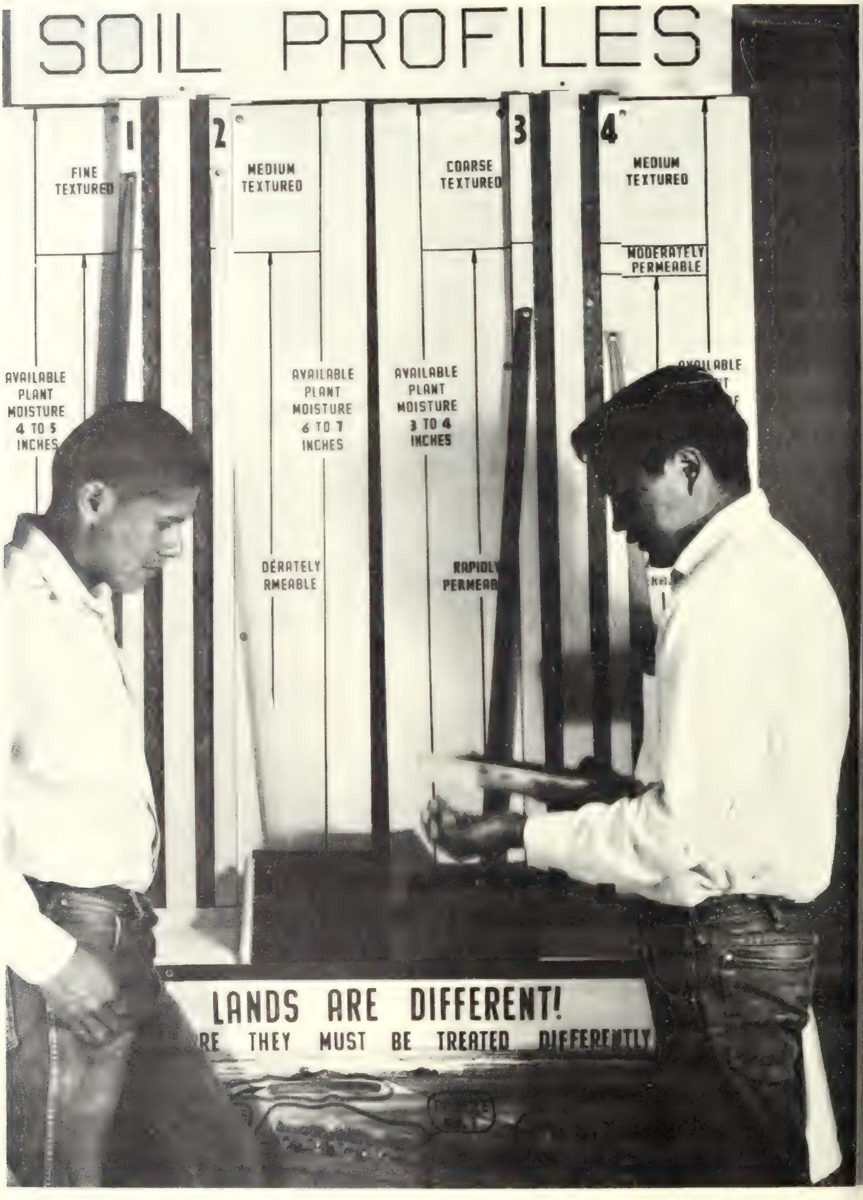
Another method of improving Indians' understanding of the use and management of their resources is through conservation youth camps, part of the summer programs mentioned earlier. Thus, at the Fort Defiance Subagency on the Navajo Reservation in Arizona, four such encampments were organized in fiscal 1963 and probably will be continued in future years. The goal of the camps is to help the boys and girls learn about soil and range conservation from qualified technicians while they perform valuable work on the land.

Efforts are also being made to promote fuller Indian appreciation of the potentialities of their reservation resources for recreational development and use by tourists. Through meetings organized by the Bureau and explanations provided by BIA specialists, Indians on many reservations are becoming enthusiastic about these possibilities and have begun planning for recreational development. In several instances, advice and help are being sought from other agencies of Government with special expertise in the recreational field.

## Irrigation Activities

In the calendar year 1962, more than 837,000 acres were farmed on Indian irrigation projects. They produced crops valued at $67.3 million. Work advanced in rehabilitating facilities and extending them to new lands.

In this connection, the Bureau conducted studies at all the more important projects to gather engineering, soil, and economic data that can be used both in depicting the present status of each project and in developing orderly plans for necessary rehabilitation and



Through youth conservation camps organized by BIA, young Indians are being give a better understanding of the lands and other resources on reservations that compris their most precious heritage.

further expansion to the full potential. Studies were completed on the Fort Peck and Flathead Projects in Montana and the Wapato Project in Washington.

Another noteworthy development was the work being done at several localities to convert reservoirs built originally as capital investments for Indian irrigation projects into important recreational assets. An example was the Wild Horse Reservoir adjoining the Western Shoshone Reservation in Nevada. After completion of construction, the manmade lake was stocked with fish and this has created a demand for camping and picnicking facilities along the shoreline which has already become more economically significant than the original irrigation purpose of the reservoir. Potentialities for similar development at other Indian irrigation projects are being actively explored.

## Lease Income Gains Slightly

Although income from leasing of Indian lands for oil and gas and other mineral development declined in fiscal 1963, it was more than offset by a gain of roughly 30 percent in income from grants of surface uses, both leases and rights-of-way. Such income totaled $13.1 million compared with $10.1 million in fiscal 1962. The gain was largely attributable to greater awareness of rental values resulting from the Bureau's expanding real estate appraisal activity.

Despite the decline in income from mineral leasing, the following significant developments occurred:

. . . A coal mining lease covering nearly 8,800 acres on the Navajo Reservation in New Mexico was approved. The lease resulted under an exclusive exploration permit approved in March 1959. It still contains an option for leasing an additional 13,880 acres. Under the lease, the coal mined is to be used for fuel in a proposed gasification plant to be constructed on the Navajo Reservation.

. . . An exclusive 2-year permit to prospect for minerals other than oil and gas covering 19,200 acres of tribal land on the Gila River Indian Community, Arizona, which grants an option to lease, was approved. This marks the first effort in mineral exploration by modern methods on this reservation.

. . . Another "first" was an oil and gas lease sale held on the Northern Cheyenne Reservation, Mont. Bonus offerings totaled $177,327.

Indian irrigation projects in 1962 produced crops valued at $67.3 million. Studie are now underway to provide a factual basis for appraising the present economic strengt and potential future benefits of these projects.

In the summer of 1962 a three-man task force appointed by Secretary Udall visited the native areas of Alaska to study the effectiveness of local programs of the Bureau of Indian Affairs. Here two task force members confer with Eskimo villagers at Point Hope who have been skinning walrus.

# TASK FORCE STUDIES ALASKA

In 1961, the Secretary of the Interior appointed a special task force to study Indian affairs throughout the Nation. Because of an extremely crowded schedule, the group was unable to visit Alaska. In its report, however, it commented briefly on Alaskan programs of BIA and emphasized the need for a separate study of these activities. As a result, Secretary Udall scheduled a special Alaskan study to begin during June 1962.

Serving on the task force, which traveled more than 5,000 miles throughout Alaska, were W. W. Keeler, principal chief of the Cherokee Indian Nation, chairman; Hugh J. Wade, Secretary of State for Alaska; and James E. Officer, Associate Commissioner of Indian Affairs. They submitted their report to the Secretary in December 1962, and some of their suggestions have already been carried out. Groundwork for fulfillment of others was laid in fiscal 1963.

Recommendations of the task force cover education, the serious native land problem, the BIA loan program which has made it possible for the Indians of southeast Alaska to operate village salmon canneries, the Eskimo reindeer herding program, and hunting and fishing matters which are of vital concern to the native population.

## Education

Native children in Alaska lag behind the general population in educational attainment because of lack of schools and because of a deficiency in the English language.

To combat this situation, the task force recommended that the Bureau's Branch of Education intensify its collaboration with the State of Alaska to develop an adequate educational system that will include Indian and native children throughout Alaska. Task force recommendations in keeping with this goal include providing better educational services in the native villages, expanding the regional high school program, and providing greater vocational training and placement opportunities to the natives.

In realizing these suggestions, the Bureau has continued to expand elementary and high schools in the native villages where it has responsibility. The 1963 fiscal year budget provided $4,511,000 for the planning, construction, and major improvement of new and expanded elementary school buildings and utilities. Funds were appropriated for building of high schools at Unalakleet, Barrow, and Kotzebue. In addition, a teacher-directed correspondence program was made available by the Bureau to high-school-age students and adult natives in isolated areas. Hot-lunch programs were started in all Bureau schools, and the boarding school program continued to operate on an expanding basis throughout the year. Other accomplishments included the addition of the ninth-grade level at Wrangel Institute and the provision of 150 additional spaces for Alaskan youths of high school age. The spaces were provided at Chemawa Indian School in Oregon.

Vocational assistance, scholarship aid to qualified college-age students, and provision of additional opportunities for commercial and vocational training for Alaskan natives at the Haskell Institute also were realized throughout fiscal 1963. The Bureau likewise intensified its adult education program in the villages.

The extent of BIA participation in education is characterized by the fact that during fiscal 1963, the Bureau financed and operated 83 schools in Alaska, completely subsidized 21 others (under Johnson-O'Malley funds), and provided financial help to 5 others. Total cost of the program was over $7 million.

## Hunting and Fishing Studied

The most widespread forms of livelihood for the Alaskan natives, especially the Eskimos and Athapascans, are fishing and hunting. While these subsistence activities have been improved upon by modern technology, many problems remain. The task force devoted much of its 110-page report to the controversy over enforcement of the Migratory Bird Treaty of 1916 which forbids hunting of certain types of migratory fowl in Alaska when fresh meat is in short supply. The task force recommended a thorough study by the Department's Fish and Wildlife Service to determine possible relief to Indians in this matter.

In addition, task force recommendations started special studies of hunting and fishing license programs in Alaska. These concerned activities of big-game hunters in the sport killing of polar bears from low-flying planes, the hunting and conservation of walrus, and bag limits on migratory birds.

In response to these studies, Alaskan and BIA officials in 1963 directed their employees to provide outlying villages with qualified agents to issue token subsistence licenses, provided for by the Alaska State Legislature in a law of March 14, 1963.

State and BIA cooperation fulfilled another Task Force recommendation—assuring native representation on the Alaskan State Board of Fish and Game and on local district advisory boards. At the end of fiscal 1963, 4 of the 10 State board members were Alaska natives.

## Economic Development

Contrasted to the economic development programs for the Indians of the lower 48 States, the program in Alaska in tribal enterprise was rather limited. This is true regarding reindeer herding, arts and crafts, canneries, tanning, and mining.

The oldest economic development activity for Alaskan natives and one with many vagaries is the maintenance and care of reindeer herds. This activity is suffering from a conflict of the natives' time and interests. A BIA official in Alaska reports that many Indians leave their herds at a crucial time in the season to go hunting and fishing.

Other problems impeding the natives' economic progress in the reindeer industry result because they have been relatively unacquainted with herding practices and because markets for reindeer meat are scarce. Bureau and task force studies have recommended programs to improve reindeer management and marketing.

Similar to reindeer herding problems are arts and crafts. The task force report indicated that arts and crafts had not flourished partly because the natives feel prices do not compensate them adequately for time spent in manufacturing curios.

The Arts and Crafts Board of the Department, established to further such activities among Indians and Alaskan natives, has had a representative in Alaska since 1952. The supervisor is aided by several employees throughout the State's Indian regions.

Regarding industrial development, the task force cited the need for classifying the native communities (which are widely differentiated) in terms of their economic needs and development potential. The force also felt that a "peace corps" program may be the only realistic approach to improving the economy of the Alaskan communities where isolation and lack of technology have limited development.

## Land Problem in Alaska Complex

In its report, the task force emphasized that the land situation in Alaska has tended to hamper development among the Alaskan natives. In the Alaskan Organic Act of 1884, Congress promised that the natives "shall not be disturbed in the possession of any lands actually in their use or occupation or now claimed by them," but reserved to itself a determination as to how title to these lands might be conveyed. As a result of the Alaskan Statehood Act of 1958, which authorized the State to select more than 100 million acres from the public domain, the question of native rights under the 1884 act has now become a main issue. Some of the lands claimed by the natives have already been selected by the State.

The task force suggested several steps for resolving this controversy. These include granting individual natives the title to home sites and hunting and fishing sites; withdrawing acreages in near native villages for their growth and development; establishing native hunting and fishing privileges in larger areas; and setting up a special tribunal for considering native claims for lands taken from them by others since 1884.

It also recommended that Congress prescribe a definite period in which to adjudicate native claims so the State land selection program will not be indefinitely postponed.

All these recommendations were under consideration at the close of fiscal 1963.

## Credit Operations Pose Problem

The Bureau of Indian Affairs has operated a credit program in Alaska since 1936. At the close of fiscal 1963, about 40 percent of the outstanding loans from the Bureau's revolving fund were concentrated in this area. Alaska has long constituted the Bureau's chief credit problem area. About 93 percent of the entire reserve of the Bureau for potential losses on loans is for loans made in this area.

The program falls into three principal categories. In terms of amounts loaned, the largest is for the purchase, maintenance, and operation of salmon canneries at four communities in southeastern Alaska. A fifth cannery is operated by a native association, but it is not financed by the Bureau. The cannery program of the four communities generally has not been successful. There are many reasons, but the shortage of fish is the main cause. Operations in 1962 were again unsuccessful. In addition to small packs, the price of canned salmon declined and pack sales were slow, increasing costs.

Under recommendations in the task force report, a private research organization is studying possible diversification and expansion opportunities. This will help determine the feasibility of continuing operations. To increase production, funds have been made available for the purchase or construction of nine additional large boats to fish for the canneries. A tentative plan for consolidating the canneries has been developed, but activation will await a study still underway at year's end. A conference at Juneau, attended by representatives of the village associations, attempted to develop closer working relationships between the Bureau and the village councils.

The second category involves loans to native organizations for relending to members. About 78 percent of the amount in this category outstanding at the close of the year was to the organizations operating the canneries, which finance the fishing activities of their individual members. Generally, the loans were not in good condition. Arrangements were made to permit title to boats purchased with loans to be retained by the community associations, in accordance with the suggestion of the task force.

The third category involves loans to native organizations in remote areas of Alaska for operating stores and trading posts. This program has been successful. In harmony with recommendations of the task force, seven additional loans totaling $189,500 were approved during 1963 to enlarge this program. This program has probably benefited more people with a comparatively small amount of money than any other loans made from the revolving fund. Only about 13 percent of the outstanding loans at the close of the year were for this purpose, but they were benefiting a native population of over 9,000. In contrast, loans to the four cannery villages represented about 80 percent of the unpaid loans, and were benefiting a population of less than 1,500.

Indian tribes need effective and stable governments in order to take full advantage of economic development opportunities. Elections, like this one on the Navajo Reservation, are an important part of the process.

# TRIBAL OPERATIONS PROMOTED

In tribal operations, the Bureau's primary mission is to help Indians improve and stabilize their political structures and assist them in developing their tribal business capabilities. These goals are more rapidly achieved when the tribes themselves furnish able leadership toward these ends. Some 251 tribes, bands, or other identifiable groups of Indians and Alaska natives throughout the United States function with written organizational documents, and over 150 others are self-governing on a more informal basis.

## Tribal Government Gains

Fiscal 1963 marked the awakening of tribes in many areas to their growing political and economic responsibilities. The need for effective government and business management became more apparent as large sums of money were awarded to some tribes by the Indian Claims Commission. The Bureau's efforts were directed toward overcoming historic suspicions regarding modern governmental procedures. A particular target was Alaska, where Bureau specialists in tribal organization were assigned among the Indians and Eskimos for the first time. Wainwright and Angoon were newly incorporated as fourth-class cities and nine other villages either incorporated under State town laws or set up credit associations. Many others were reexamining their political structure with a view to make changes to meet modern situations.

Specific attention was devoted to updating tribal organizational documents among the numerous Indian groups of western Washington, where political development has been slight. The Quinault Tribe, having the largest reservation in the area, drew up a constitution and bylaws which, when adopted, will permit advancement in both political activity and economic development. Likewise, the Suquamish, the Skokomish, the Squaxon Islanders, and the Lummi moved toward more effective tribal organization. Elsewhere in the Pacific Northwest, the Warm Springs, Coeur d'Alene, and other tribes began discussing the need for changes in their organic documents.

The Winnebago Tribe of Nebraska amended virtually its entire tribal document to enable it to cope with present responsibilities. The Winnebagos of Wisconsin adopted a new constitution and bylaws.

Throughout the year, aid was provided the Executive Committee of the Minnesota Chippewa Tribe in modernizing its organization

The tribe's document limits the authority of the six tribal bands and fails to provide the representation they want. An amended version has been approved and the tribe will vote to accept or reject it. The amendment election poses a difficult problem since the Indian Reorganization Act requires that at least 30 percent of the eligible voters participate. Over half of the population has moved from the reservation, increasing the possibility that a quorum may not participate in the constitutional election.

The Seminoles of Florida significantly amended their constitution and charter during the year. The tribe's organization is now unique, separating political functions from business management. Several other tribes are studying this arrangement for possible use.

The Crow Creek and Lower Brule Sioux made organizational changes to meet the increased responsibilities created by the Big Bend Dam and Reservoir project. Simplified articles of association for the Las Vegas Colony and Summit Lake Reservation (Nevada) and the Santa Rosa Rancheria (California) were developed to meet the needs of these comparatively small groups without overburdening them with complicated and expensive political machinery. The Bureau is trying to interest other small tribes in streamlining their organizations.

## Tribal Funds Used for Rehabilitation

Assisting tribes in the effective control and use of their funds has long been a major program of the Bureau. In seeking to improve tribal management, the Bureau in fiscal 1963 helped in developing a $4 million rehabilitation program for the Crow Creek Sioux Tribe (South Dakota) ; a $2 million program for the Lower Brule Tribe (South Dakota) ; a $10 million program for the Crow Tribe (Montana) ; and smaller programs for the Nez Perce (Idaho), Ute Mountain (Colorado), Navajo (Arizona, New Mexico, Utah), Yakima (Washington), and other tribes. Administrative plans, tribal enterprises, housing authorities, and many other organizational devices were used to implement and improve tribal business operations.

In fiscal 1963, approximately $67 million in tribal funds from annual income and from judgment awards was employed for many purposes. About $50 million went for special tribal programs, community development, economic development, and capital investment; and $17 million went to tribal members in the form of dividends, family plans, and outright per capita payments.

Indian leadership has shown increasing interest in developing administrative proficiency and in economic programs upon which stronger and more durable communities can be built. This is evident in their willingness to commit millions of dollars to special projects. The present situation contrasts with the strong view of a few years ago that unrestricted per capita payments to individual members represented the only acceptable use of tribal capital. Many Indian leaders now advocate programing for development and for income-producing ventures first, and dividend payments second.

## Many Tribal Claims Settled

In 1946, Congress created the Indian Claims Commission to hear and determine claims of tribes, bands, and other identifiable groups of Indians in the United States. More than 850 claims were filed; 138 have been dismissed. Seventy-three claims have so far brought 43 awards totaling $95.9 million. (These awards have been made primarily as additional payment for the taking of 143 million acres of land.) Six hundred and forty claims remain to be adjudicated and are in various stages of prosecution.

During fiscal 1963, Congress appropriated $7,315,000 to the Pawnee Tribe; $4,647,000 to the Miami Tribe of Indiana and Oklahoma; $3 million to the Kalispel Tribe; $97,025 to the Tillamook Band; and $72,162 to the Nehalem Band of Tillamook Indians. Besides this total of $15,132,000 which was appropriated, awards were made for an additional $10,100,000 involving cases either on appeal to the Court of Claims or for which Congress had not yet appropriated funds. Undoubtedly the remaining 640 claims, if they are successfully adjudicated, will provide financial opportunities unparalleled in tribal history. Liability has been established in some 60 instances and the prospect of 15 to 20 new awards each year is indicated.

Many of the tribes have claims for the taking of large tracts, but are not able to finance the cost of appraisers to set a value for the land.

# Bureau of Land Management

## Charles H. Stoddard, Director

The 466 million acres of public lands administered by the Bureau of Land Management are among our Nation's most valuable natural resources. On the public lands are some of the most productive forests, and under the public lands lies much of the mineral wealth necessary for our modern economy. The public rangelands provide forage for thousands of cattle and sheep, and for another national treasure—our native wildlife. The public lands contain developed recreation values and even greater potential for all citizens to enjoy through hunting, fishing, camping, or simply being outdoors.

Through its program of *multiple-use* management of the public lands, the Bureau of Land Management seeks to balance all beneficial uses for the public domain. The BLM works constantly to protect resources from natural and manmade hazards such as fire and erosion. BLM engineering programs help make multiple-use management and protection possible.

This report presents BLM's accomplishments in fiscal 1963 in all these areas of its activity. It also outlines many of the Bureau's plans to continue to improve the public lands and their management.

The national responsibility of the Bureau of Land Management was clearly stated by President Kennedy in his special message on natural resources of February 23, 1961: "We cannot, however, delude ourselves—we must understand our resources problems, and we must face up to them now. The task is large but it will be done."

## Legislation Aids Efficiency

Effective management of the public lands depends in part upon efficient processing of applications filed by the public for public land. In the past, difficulties in prompt handling of applications led to delays in needed disposals, complications of management problems, and large expenditures for "paper processing." Full correction of this situation requires legislation, as well as administrative departures.

A major administrative step in this direction was the adoption of a complete revision, effective June 14, 1963, of part 296 of title 43 of the Code of Federal Regulations. The changes are expected to expedite the handling of applications for public lands by BLM in cases where land classifications or similar determinations are involved.

A key aspect of the new regulation is that it clearly distinguishes the two parts of the application process: (*a*) a petition for classification and opening of the land to entry and (*b*) application for entry.

The new regulations specify the land laws under which classification and other action to open lands to disposal are necessary. They also specify the general criteria to be used by the Department in making the classification decision. They further streamline procedures by moving the review of classification actions from appellate channels to administrative channels.

Another significant simplification of public land procedures was restriction of small-tract applications to areas opened to such application.

Much attention was devoted to updating regulations. Twenty-five proposed changes in regulations were being developed or had already been submitted for departmental approval at year's end. Most were designed to bring regulation language clearly into line with departmental decisions, so people doing business with the Government would be given a clear impression of the current rules and what they mean.

To further the program of modern management of the public lands on a multiple-use basis, several legislative proposals were introduced in the 88th Congress.

## Congress Enacts Land-Management Bills

Two important public land-management laws were enacted by the 87th Congress. They are the Mining Claims Occupancy Act of October 23, 1962 (Public Law 87–851), and the Petrified Wood Act of September 28, 1962 (Public Law 87–713).

The Mining Claims Occupancy Act applies generally to unpatented and unpatentable mining claims which were used as principal places of residence on October 23, 1962, and since July 23, 1955. The law permits certain "old" occupancy situations to be legalized for as long as the public interest allows. Under certain circumstances, persons living on unpatented mining claims may acquire an interest in the lands from the Federal Government. A 5-year period had been provided for people to apply for privileges under the act. The act was passed as the key measure to terminate the unauthorized occupancy of public lands based on invalid mining claims.

Public Law 87–713 excludes petrified wood from location under the mining laws and provides for free use of it by hobbyists and scientists. The law was passed to protect the public recreation values of deposits of petrified wood on the public lands.

## LANDS OFFER RECREATION

The Bureau of Land Management is responsible for the conservation, management, and development of nearly one-half billion acres of the Nation's public lands. They include nearly 300 million acres in Alaska and some 175 million acres in 27 other States.

In his first natural resources message, President Kennedy called the Nation's attention to the importance of the public lands under the jurisdiction of the Bureau of Land Management. His message contained a mandate for action and established conservation goals to which the Department is committed. The portions of this program particularly applicable to the lands and recreation activities of BLM are the *inventory* and *evaluation* of the public lands outside Alaska, and the development of a program of multiple use designed to reconcile the conflicts among the wide variety of uses of these lands. The Bureau's goals in this connection are: the development of public land laws responsive to conditions which now exist; improvement of the land tenure pattern; substantial reduction in annual resource losses from fire, insects, unauthorized use, vandalism, water pollution, and waste; and improvements and extensions of access roads, structures, and facilities for the protection, improvement, and recreational use of the scenic, wildlife, and other resources of the public lands.

### Public Land Moratorium Terminated

The moratorium declared by the Secretary against the filing of nonmineral applications for public lands in all Western States ended September 4, 1962. During the previous 18 months the

The Bureau of Land Management maintains facilities on public lands for recreationa use of scenic and wildlife resources. This covered picnic area with elevated stove is part of an accelerated public works project at the Red Cliffs Recreation site near St. George, Utah.

Bureau of Land Management was able to reduce a backlog of more than 41,000 applications to less than 18,000, a reduction of approximately 57 percent. Outside Alaska (where because of the settlement laws, the moratorium had only minor applications) there was an even more effective reduction of two-thirds. In addition, the moratorium was lifted ahead of schedule in 8 of the 17 States originally affected. Elimination of the greater part of the pending caseload resulted in action on the cases and also freed personnel and resources for other important work.

## Inventory and Evaluation Advance

The Master Unit Study System, put into operation during fiscal 1962 in direct response to the President's call for "an inventory and evaluation of the Nation's public domain holdings," was progressing on about 175 million acres of public lands. To accomplish this task, the system is divided into four major steps:

> Accumulate all available basic data, and on the basis of these data define general units of study. These units are defined on the basis of similar physiographic and economic characteristics, and are called Master Units;
>
> Analyze the available data for each of these Master Units and determine to what uses certain specific areas within each Master Unit are most suited in terms of land capabilities and resource needs;
>
> Study the areas in detail to determine the action programs necessary to realize their capabilities and meet their needs; and
>
> Outline, schedule, and effect the action programs. Thus the system will be, in effect, the first master planning tool for these public lands.

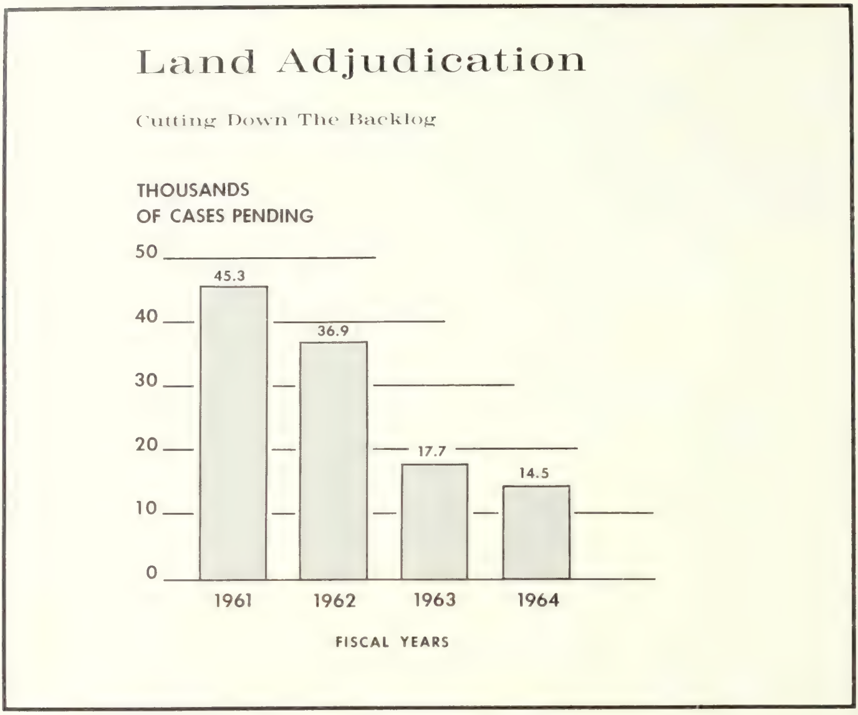
By year's end, trained technicians had completed nearly all initial analysis work. Detailed analysis started in many areas.

## Disposition

During fiscal 1963, 4,858 patents were issued by the Bureau of Land Management which transferred ownership of 639,316 acres. This total does not include 20,534 acres in school lands, 82,944 acres in Indian Fee and reissue trusts, and 67,905 acres in curative and supplemental patents, a total of 171,384 acres not included in the final total. These disposals were made under a variety of public land laws to private citizens and nonprofit organizations, State, county, and local governments, and other Federal agencies.

The Bureau issued 441 patents for 59,874 acres under the homestead laws and 231 patents issued for 52,662 acres under the Desert Land Act for agricultural development. In addition, 2,162 small tracts were patented involving 7,343 acres. There were 83 exchanges consummated on a total of 66,062 acres. Conveyed to the States were 262,565 acres under 88 separate grants.

For a discussion of disposals made under the Recreation and Public Purposes Act, see the following subsection.



## Outdoor Recreation Enhanced

The use of the public land under jurisdiction of the Bureau of Land Management for outdoor recreation purposes continued to increase rapidly. Recreation is becoming a full partner with livestock grazing, mining, timber production, and other resource management activities. However, private development and needs are exerting great pressure on all these resources, especially in areas where population is expanding rapidly.

Every year many millions of people hunt, fish, camp, and picnic on the 466 million acres of BLM-administered land, most of which is in 12 Western States, including Alaska. These lands contain some of the most spectacular desert scenery and rugged mountain and canyon country in the United States. There were over 15 million recreation visits to such lands in 1963.

But because of the lack of even minimum sanitation and recreation facilities on most of the land, many visitors unintentionally abuse the areas, creating litter and fire hazards, accelerating erosion, and polluting vital water sources.

The need for designated recreation sites with essential facilities to protect the public lands and to provide for their recreational use by the public has led the Department to request funds for the construction of minimum facilities. Under the authority of the Oregon & California Act of 1937, some 50 campgrounds and picnic areas have been built since 1958 in western Oregon. As a pilot effort, the 1963 Accelerated Public Works program provided about $1,400,000 to construct minimum access and protective facilities on 49 public land sites in economically depressed counties of 8 States.

Recreation, fish, and wildlife resources on the public lands are being inventoried and evaluated. Acute problem areas will be identified for corrective action, including the installation of needed facilities. The overall potential of the land to provide public benefit will be determined. The long-range objective is effective integration of recreation resources and their proper functions into a system of multiple use. Important aspects of the inventory are the identification of archeological and historical remains for protection and the identification of sites suitable for transfer to non-Federal public agencies under the Recreation and Public Purposes Act of 1954.

Working for BLM, employees of accelerated public works improved boat-launching facilities on Walker Lake, near Reno, Nev.

Improvement of wildlife habitat and preservation of the wildlife resource is a basic part of the Department's program to insure the best care and management of the public domain. Fourteen land management areas in California totaling 810,570 acres of public lands are being managed on a cooperative basis by the Bureau of Land Management and the State. Plans for special intensive management on a demonstration basis of scenic, wildlife, and other natural resources are being formulated for certain other areas in California, Oregon, and Utah.

In harmony with the recommendations of the Outdoor Recreation Resources Review Commission, States and local government agencies are encouraged to acquire tracts of public domain land for recreation and other public purposes under the Recreation and Public Purposes Act. The land is made available only if a definite plan of utilization and schedule of development are submitted. By establishing the low charges of $2.50 per acre for purchases and 25 cents per acre per year for lease, the Department encourages communities to expand their open space and recreation programs.

During the past 2 years, 133 patents totaling 11,277 acres have been issued under the act and 142 leases totaling 90,000 acres have been put in effect. To stimulate even greater use of this opportunity for State-Federal cooperation, the Department has published a comprehensive brochure which explains to prospective applicants the opportunities that exist under this program and the procedures that are to be followed in making application.

Of growing significance are the patents issued under the Recreation and Public Purposes Act. During fiscal 1963, 98 patents were issued under the act for 11,816 acres. Of these, 73 patents were issued for 10,275 acres under the new special pricing schedule of $2.50 per acre. Some of the land conveyed under this act is used for public education and public health purposes. Included in the year's Recreation and Public Purposes transfers were Angel Island, San Francisco Bay, Calif.; Imperial Hot Spa, California; Smith Rocks State Park, Oregon; and Grand Lake Park, Grand County, Colo.

## MANY ACCELERATED PUBLIC WORKS PROJECTS UNDERTAKEN

On September 14, 1962, the President signed into law the Public Works Acceleration Act (Public Law 87–658). This law enabled Federal agencies to initiate or accelerate, upon approval, public works projects to help erase unemployment.

Local workers employed under the accelerated public works program are shown improving an access trail to the scenic Rio Grande Gorge administered by the Bureau of Land Management in New Mexico.

The type of public works intended by the legislation proved ideal for the Bureau of Land Management. Most of the Bureau's projects are relatively small and can be accelerated and completed in a short time. The completed projects have an immediate beneficial effect on public lands and also aid in the future management of the land's water, wildlife, forage, mineral, and recreational resources.

In October, the Bureau received $1,972,000 as its first allocation of APW funds for projects in northern New Mexico, northern California, southwestern Oregon, south-central Utah, and southern Nevada. In less than a week the Bureau had 192 APW workers on its payroll.

Subsequently, the Bureau received APW funds in several allocations which totaled $6,537,000 by year's end. This money was distributed among 44 separate projects in 10 of the Western States. Each project had to be approved by the Bureau, the Department, the Area Redevelopment Administration in the Department of Commerce, and by the President before it could receive funds.

Because salaries of permanent Bureau of Land Management employees cannot be paid from Accelerated Public Works funds, al supervision, planning, and contract preparation was done by permanent Bureau personnel financed by regular BLM funds.

The Bureau had scheduled the following for completion in fisca 1963 under APW funds: 150 miles of access roads; 2 buildings 49 recreation sites containing 518 family units; 3 road maintenanc projects; timber stand improvement on 24,000 acres; site improvement on 10,000 acres; seeding 20,000 acres; brush control on 5,00 acres; 1,300 erosion control structures; 482 miles of fencing; 70,00 posts cut; 300 cattleguards; 57 livestock and wildlife wells; 4 springs and water developments; 250 wooden gates fabricated rodent control on 120,000 acres; 10 miles of stream clearance; an 53 miles of stock trails.

The funds were allotted among States as follows:

| *State* | *Amount* |
|---|---|
| Alaska | $35,000 |
| California | 702,500 |
| Colorado | 168,000 |
| Idaho | 180,000 |
| Montana | 201,100 |
| Nevada | 260,000 |
| New Mexico | 1,059,000 |
| Oregon | 2,432,300 |
| Utah | 1,383,100 |
| Wyoming | 116,000 |
| Total | 6,537,000 |

Typical major APW projects were:

**Eureka Project, California:** This involved construction of miles of access roads, foot trails, and protection and sanitati facilities in the scenic King Range recreation area of Humbol County.

**Taos Project, New Mexico:** Included development of six recre tion sites and parking areas, and 11 miles of foot trails in the R Grande Gorge recreation area. Many of the trails, which provi access to the good fishing waters and scenic beauty of the Rio Grande River, were blasted from solid rock.

**Josephine Project, Oregon:** This consisted of 400 acres of timber site improvement, 1,000 acres of pruning and thinning, 1,000 acres of snag felling, and protection and sanitation facilities at Deer Creek. Some of the Rogue River trail, which traverses approximately 18 miles of the most scenic country in Oregon, was improved. Also approved for construction in Oregon were several projects for access roads to aid in harvesting timber blown down during the devastating windstorm of October 12, 1962.

**Garfield Project, Utah:** Stagnated ponderosa pine stands were thinned to allow more rapid growth of the selected trees. The felled trees were pushed into washes and gullies to act as erosion-control structures. In the same project, stands of juniper were

he Bureau of Land Management was one of the first Federal agencies to begin construction ojects under the accelerated public works program. New employees, hired under the ogram, get safety instructions on their first day at work on the Rio Grande Gorge in ew Mexico.

removed and replaced by ponderosa pine seedlings and crested wheatgrass. Everything of value was utilized. Fenceposts salvaged from downed juniper trees were used in fencing the area to protect the tree and grass seedlings until they could become established. Protection and sanitation facilities were constructed at three sites.

**Canyonlands Project, Utah:** This project included the construction of protection and sanitation facilities along the eastern rim of the Colorado River. These facilities are within a buffer zone surrounding the proposed Canyonlands National Park. Nearly 600 man-years of on-site employment were created on BLM administered lands. In addition, the APW program has enabled many citizens to become closely acquainted with the functions of BLM in the administration of the public lands.

Through the APW program, the Bureau of Land Management demonstrated its ability to proceed on short notice with any improvement, protection, conservation, or maintenance program on the public lands under its jurisdiction.

## FOREST RESOURCES SAFEGUARDED

In the years ahead, increasing demands will be made on the Nation's forests, one of our most vital renewable resources. The country will need lumber, plywood, and pulp, and other forest products. By 1980, the Nation's demand for timber is expected to be at least 25 percent greater than now. In addition, the forest lands themselves are a source of much of the Nation's water, forage, recreational opportunities, minerals, and wildlife. To meet all these future needs, increasingly efficient forest and woodland management is necessary throughout the Nation.

The Bureau of Land Management, in its own area of administration, is striving to meet this challenge by applying the latest techniques in multiple-use forest management.

### Uniform Practices Followed

To approach uniformity in timber sale and management practices on Federal forest lands, the Secretaries of Agriculture and the Interior continued the cooperative effort that began subsequen to President Kennedy's request in 1961. Differences in timbe sale and inventory practices were studied further in 1963.

Timber salvage operations are underway on BLM lands in western Oregon where more than 1.2 billion board feet of timber were down after a severe storm in October 1962. Removing the fallen timber will lessen the threat of bark beetle epidemics.

## Forest Management

To meet future demands, more wood fiber must be obtained from fewer acres. A major goal for all BLM commercial forest land in the Western States is to reach a maximum sustained-yield level. The management of the Oregon and California Railroad Grant Lands (O&C), the Coos Bay Wagon Road Lands (CBWR), and public domain lands in western Oregon has pointed the way to such an objective.

Lands administered by BLM in western Oregon are producing timber at an annual rate of approximately 1 billion 127 million board feet. These lands are examples of intensive, large-scale administration of public forest land. Besides these projects, management activity on approximately 4 million additional acres of commercial forest lands in the Western States was being steadily increased to bring these forests to full sustained yield capacity. Woodlands management will be increased on another 29 million acres of lands.

On October 12, 1962, a wind and rain storm hit the west coast with hurricane force. It toppled or damaged approximately 1¼ billion board feet of timber on lands administered by BLM. Plans to sell the allowable cut of green timber had to be abandoned. Instead, the Bureau faced the gigantic task of measuring and preparing the salvage timber for sale before a deadline imposed by the twin hazards of damage by fire and insects. A further complication was the scattered, jackstraw pattern of the damage, a condition which made access doubly difficult.

In cooperation with other public agencies and with the timber industry, BLM immediately started planning a salvage program. This program sought to minimize losses from the storm by removing damaged timber by the summer of 1964, and at the same time maintain the sensitive market balance in the lumber industry. By year's end, BLM had sold approximately 926,544,000 board feet of salvage and green timber and was ahead of schedule in the salvage program.

During the past year, both before the storm and after, the volume of timber sold from these lands totaled 1,567,267,000 board feet valued at $36 million, a substantial contribution to the economy of western Oregon. Timber sales from public domain lands in eastern Oregon and in Western States contributed over 100 million board feet of timber valued at approximately $1.1 million.

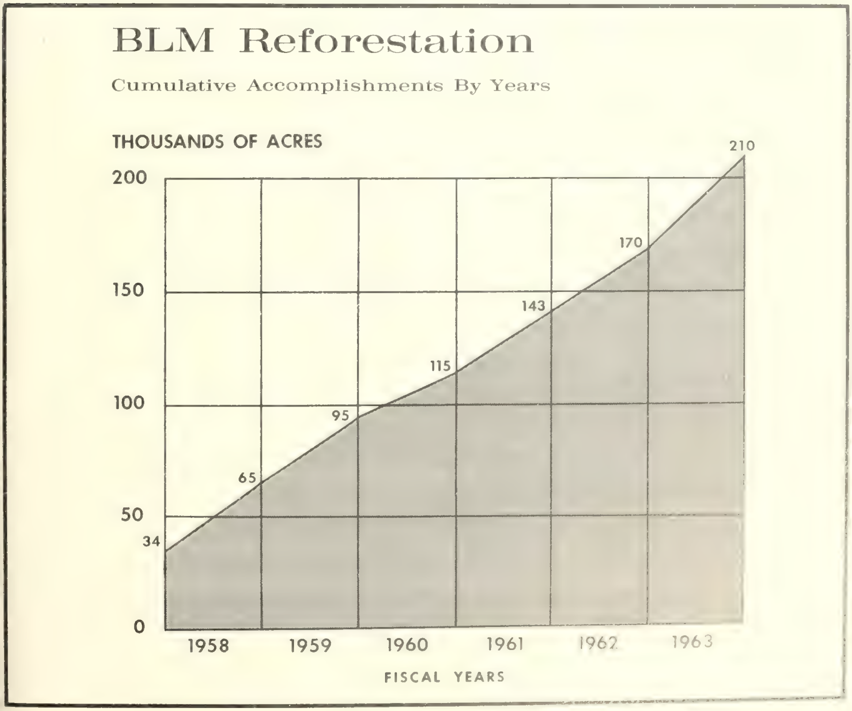
## Forest Development Aided

The major objective of Federal land and resource management is to meet future resource requirements. A progressive program for the development, improvement, and conservation of publi lands assures adequate land and resources for tomorrow. In keeping with this objective, BLM has started an accelerated program o forest development. In areas where the economy is closely relate to harvesting and procuring forest products, it is imperative tha forest lands be restored to a productive state as soon after th harvest as possible.

Prior to 1958, a total of approximately 34,000 acres under th Bureau's stewardship had been reforested. Since then, the re forestation program has been increasing at the average rate o 18,700 acres annually. This program is designed to assure a sus tained and continuing crop of timber.

In fiscal 1963, approximately 24,000 acres of forest land were planted with forest tree seedlings and approximately 15,000 acres were seeded. This reforestation effort was largely devoted to areas where timber had been harvested. In addition, areas which had been denuded by fire were reforested to restore them to productive status and to curb erosion.

On certain lands, site improvements are a prerequisite to the reestablishment of forests. These improvements include snag felling, terracing, eradication of competing brush, and soil scarification (loosening the soil preparatory to planting young trees). In fiscal 1963, site improvements on 14,323 acres were completed. Commercial thinnings, which have as their objective the production of superior crop trees and the removal of poorly formed or undesirable trees, resulted in the harvest in western Oregon of 7,657,000 board feet with a value of $147,089. Thinnings were also made on approximately 6,500 acres of forest lands where the trees had not yet reached commercial size. While there is no immediate monetary return from the trees removed in such operations, the result



is increased volume and value on stands which may otherwise stagnate. Growth of the remaining trees is often dramatic when young stands have been thinned.

### Forest Inventory Continues

A full inventory is necessary for sustained yield management. A forest inventory, similar to that completed in western Oregon in 1959, was underway during the year on the commercial timberlands of the public domain in other Western States. It is scheduled for completion in 1965. Permanent sample plots are being established so that periodic reinventory can be made.

### Access Roads Built

Full multiple use of the Nation's forest lands requires a good access road system. To harvest forest resources roads must be designed and built for heavy logging equipment. The Bureau of Land Management constructed many miles of high-standard logging roads in order to make possible harvesting mature green timber, and salvaging dead and dying timber. Accelerated Public Works funds paid for expansion of this road network to get loggers into remote areas of windthrown timber. Such a system helped make possible the Oregon salvage operation after the October storm.

Access roads allow the full utilization of forest products. Thinning programs can be conducted, and small-volume or low-value sales can be made in areas where roadbuilding costs would otherwise prohibit them, especially to small operators.

Access roads serve two other important purposes. They are needed to protect the forest from fires, insects, and disease. They make many acres of public land accessible to the public for recreational activities such as fishing, hunting, picnicking, and camping.

## RANGE RESOURCES IMPROVED

In managing the Federal rangelands in fiscal 1963, the Bureau of Land Management emphasized the principle of multiple use and the development of the range's full productive potential. Evidence of changing conditions in the overall condition of BLM's 170 million acres of semiarid western rangelands develops slowly. Nevertheless, there has been marked improvement on seeded ranges and ranges that have received brush control or other rehabilitation measures.

Range rehabilitation in the West often requires replacement of brush with more productive perennials. Here a BLM equipment operator works at reclaiming range lands in Nevada.

The most significant progress was made in laying the foundation for both continued improvement of the range and production of forage. This foundation for progress is being developed by bringing forage harvest and plant growth into balance, selecting sites which will respond to land treatment operations, and planning programs to provide optimum use of resources and sustained full production.

## Resource Inventory Underway

The BLM continued its resource inventory program—which provides accurate maps and data on forage production, range types, and existing and needed improvements. During the year 8,489,680 acres were inventoried in statutory grazing districts. Before the year, 99,354,439 acres had been inventoried. Of the 156,643,572 acres of Federal lands suitable for grazing, 48,799,453 acres remain to be inventoried. All lands within statutory grazing districts are programed for inventory by 1966.

## Range Adjudication Helps Conservation

Basic requirements for sound range management include determination of individual applicants' qualifications for Federal range use, apportioning the available range in accordance with their qualifications, and assignment of use areas and grazing seasons. These activities—termed "adjudication"—are necessary to stabilize the livestock industry dependent upon the public range—an objective fixed by the Taylor Grazing Act of 1934. Adjudication was given high priority during 1963 and is scheduled for completion by July 1, 1967.

## Range Condition and Trend Surveyed

The Bureau conducted field surveys of range conditions on approximately 20 percent of the Federal lands in the organized grazing districts. This condition survey activity provides for repeat surveys on ranges every fifth year. Data on range conditions are extremely valuable in developing and improving range management plans.

## Utilization Surveys Conducted

Surveys of the current use of forage by livestock, big game, and other animals were conducted on many range areas. Big-game concentration areas, rehabilitation sites, and problem areas received particular attention. State game departments cooperated in surveys of important wildlife areas. Evaluation of data on the use of forage (in view of the normal year's plant growth) helped BLM experts determine how much livestock and wildlife the land should support, and how much hunting is suitable.

## Grazing Fees Increased

Following a 2-year study, fees for grazing livestock on publi lands were increased from 19 cents per animal unit month to 3 cents per animal month. At the same time the portion of the fee designated for range improvement was increased from 25 percen to 33⅓ percent. This has the effect of doubling the funds desig nated for range improvement. The grazing fee increase was par of a continuing program of review and adjustment to maintai reasonable public land resource user fees and charges.

## Studies and Cooperative Research Undertaken

Scientific range management is still young and many problem remain to be solved to create an optimum balance between produ tion and use of range resources. During the past year, the Burea emphasized range studies and research.

Sheep graze high in the colorful Colorado Rockies on Alpine Range near Cinnamon Pass, on public lands administered by the Bureau of Land Management.

Revised procedures for making forage inventories on public rangelands were issued following several years' study of research findings and consultation with the Nation's leading ecologists and range scientists. This study helped inaugurate many new management techniques for rangelands.

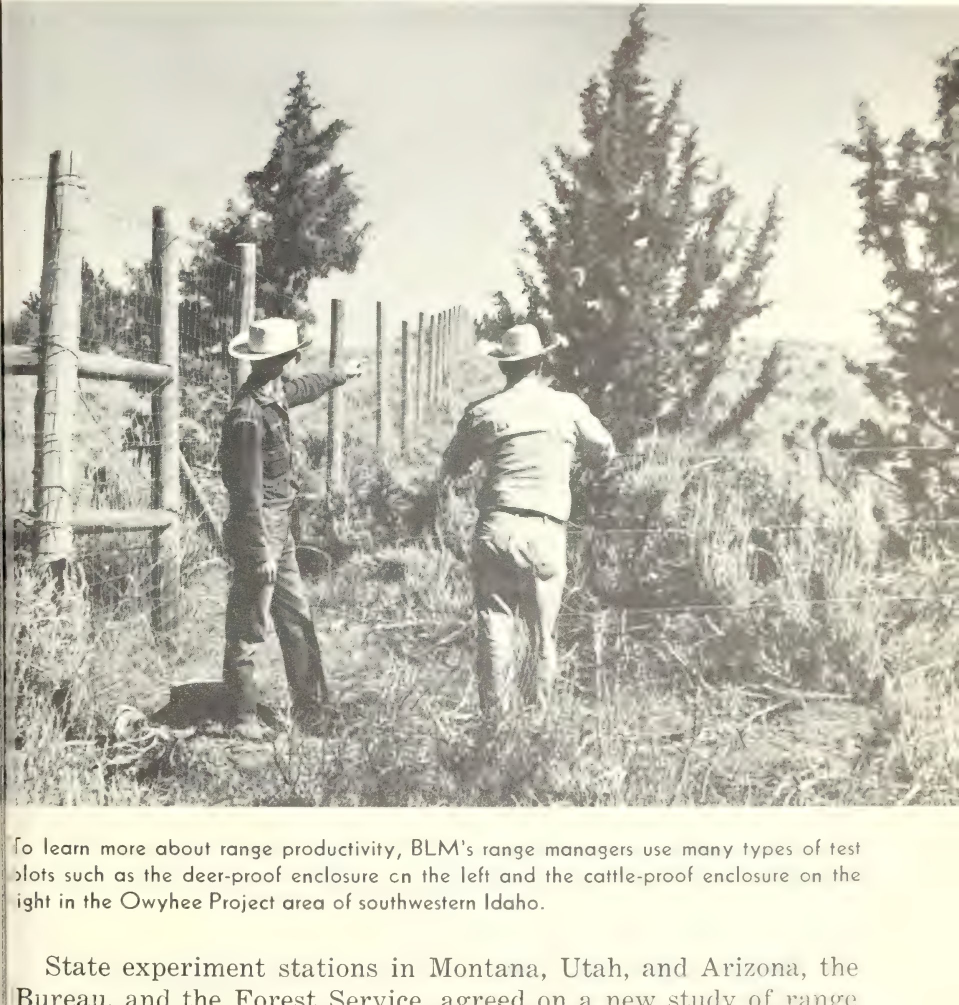
The Bureau is working to integrate economic analysis into its resource management programs. An economist trained in benefit-cost studies was employed to prepare a handbook on economic analysis. Although the experience of other agencies can be most helpful in planning water resource projects, the development of economic analysis procedures for activities of the Bureau of Land Management is a pioneering effort. Relatively little work has been done on the economics of public land resources.

The Bureau continued working closely with Federal, State, and private research agencies, with special emphasis on economic considerations. The study of western livestock ranches with the Economic Research Service, the Forest Service, and three agricultural experiment stations—begun last year—was completed. An interim report filed with the Bureau and the Forest Service was used in advisory board deliberations on grazing fees. The researchers submitted for review a manuscript of the final comprehensive report to be published in 1964.

The BLM began a cooperative study with the Oregon Agricultural Experiment Station on rates of return from investments in public rangeland improvements. Economists and ecologists are seeking to relate economic information to basic ecological data using modern computer techniques.

In cooperation with the Bureau of Land Management, the Bureau of Sport Fisheries and Wildlife began a new study to determine the effects of various types of rangeland fences on pronghorn antelope The study, being conducted in Wyoming, has received widespread interest and support from stockmen's and sportsmen's groups, as well as State and Federal agencies.

Millions of acres of public lands are covered with piñon pine and juniper scrub. These species have been considered almost worthless and thousands of acres have been cleared and seeded to grass In fiscal 1963 the BLM began a cooperative study with the Uta Agricultural Experiment Station on unrealized potentials of thes vast piñon pine and juniper areas. The relationship of the tree to the water and soil conditions of the areas is being examined i this study. It involves teams of plant ecologists, soils technicians and economists and is being conducted throughout the West wher piñon-juniper woodlands and ranges are important.



To learn more about range productivity, BLM's range managers use many types of test plots such as the deer-proof enclosure on the left and the cattle-proof enclosure on the ight in the Owyhee Project area of southwestern Idaho.

State experiment stations in Montana, Utah, and Arizona, the Bureau, and the Forest Service, agreed on a new study of range economics. Included will be an economic comparison of ranches using public rangelands to those using private rangelands. Different methods of determining the economic values of range also will be tested.

Studies of the tenure problems encountered by users of public land resources started. A special committee of the National Advisory Board Council met to analyze these complex problems. The committee submitted recommendations for the consideration of district advisory boards. The Bureau is providing professional assistance to groups cooperating in this continuing study.

The Bureau continued its cooperative study with the Soil Conservation Service of procedures for soil and vegetation inventories

The purpose is to determine the feasibility of using standard soil survey procedures or some modification of them in BLM resource inventories. The standard soil survey procedures were devised for agricultural lands. To be practical for use on vast acreages of semiarid grazing lands, survey procedures must be economical and accurate. In addition, they must provide data that are subject to meaningful interpretation for management purposes. The study will be concluded in 1964 with a consolidated report of findings at sites in Montana, Nevada, and New Mexico.

## Resource Development and Conservation Accelerated

Acceleration characterized the Bureau's resource conservation and development program in 1963. Plans were made on the basis of the total resources in individual small watersheds. There were more than 640 of these development units, or community watersheds. Each watershed is a community of interest, with natural boundaries and similar soils, vegetation, and user interest.

Total conservation needs of each community watershed are being determined by resource inventories and conservation surveys. On-the-ground application of key practices, including range seeding, brush control, water management, and fencing, has been started in areas of greatest need.

Complete conservation treatment programs were begun in four demonstration areas. They lie principally in the Vale District in Oregon (the Vale Project), the Winnemucca District in Nevada (the Beowawe Project), the Boise District in Idaho (the Owyhee Project), and the Albuquerque District in New Mexico (the Rio Puerco Project). The rehabilitation of 158,000 acres of rangeland by seeding, brush control, and mechanical land treatment is among the major accomplishments in these demonstration areas. The protection and proper use of these treated areas have been assured by modern grazing practices and by the construction of 300 miles of fences and 135 new stockwater developments. Severely eroded areas have required the construction of 45 detention dams and numerous other structures.

The number of forest and range fires during fiscal year 1963 dropped. Emergency treatment was given all fire-damaged lands where needed. Reforestation and range seeding on burned areas help prevent excessive flood and sediment damage and also assure production of timber and forage and of a continuous protective cover for the watershed.

Special problems in the control of poisonous and noxious weeds were identified and control measures were applied. Maximum

Laid barren by a disastrous fire 4 years ago, these now grass-covered hills in Idaho were restored and the soil stabilized by terracing and seeding done by the Bureau of Land Management.

efforts have been made to control the poisonous plant halogeton, the aggressive invader Medusa-head rye, and the host plants of the beet leafhopper.

Grazing by domestic livestock is a primary use of rangelands administered by the Bureau. All BLM range conservation and development activities are planned with grazing and grazing potential as a major factor. In addition, recreation, mining, forestry, watershed, and other uses are fully considered in planning and development. Local and State organizations are consulted and encouraged to become full partners in the planning and execution of range-development programs.

## Wildlife Management Grows

Americans receive many important benefits from wildlife on the public rangelands. Hunting, photography, and merely observing wildlife in its natural habitat are recreational activities of physical, cultural, and social benefit. Because of the Nation's increasing population, leisure time, and per capita income, these recreational activities have a prominent place in BLM's programs.

The Bureau's habitat development and management programs provide optimum numbers of game animals. Access roads on the public lands facilitate recreational use of wildlife resources as well as BLM's own projects of land improvement. The BLM estimates that the number of big-game animals inhabiting public rangelands outside Alaska in 1963 was 2,055,989, compared to 1,928,053 in 1962 and 1,900,529 in 1961.

Wildlife and domestic livestock share the public ranges and the Bureau has a responsibility to maintain range resources in such a way that both will thrive. State game and fish agencies, of course, have full control over scientific herd management and harvesting of game, so that disease and starvation will not result from overpopulation of game animals.

Most of the Bureau's State offices had full-time wildlife specialists in the field during fiscal 1963, conducting independent studies and working with range managers. The pronghorn antelope fencing study in Wyoming was only one of the special projects undertaken. Others included a study of the Black Rock deer herd in Arizona, which had grown so large that it was destroying the range and starving itself. As a result of the study, hunting pressure on

Close cooperation with State and local agencies is a keynote of BLM's field operations. Here a Bureau engineer and a representative of the Nevada Fish and Game Department survey the route of an access road through BLM's Battle Mountain District in Nevada the herd was adjusted and the herd was brought into proper balance with the livestock that share its range. In Nevada, the BLM is conducting an experiment on a new wildlife management instrument: the deer funnel. By a network of fences, deer are made to go through a specially built funnel under a highway. The BLM developed this device in cooperation with the Nevada fish and game officials to avoid accidents often fatal to both deer and automobile riders.

The BLM further recognized the importance of wildlife resources on the public lands when it took steps at the close of the fiscal year to staff its Washington office with a wildlife technician to guide wildlife specialists in the field. Each State office was instructed to have a full-time wildlife specialist on its staff.

## MINERAL RESOURCES INVENTORIED

The public mineral resources of the United States are the source of many raw materials for industry. The Bureau of Land Management has the duty of insuring the availability of mineral resources to the mineral industries and of encouraging exploration and development of minerals in accordance with the principles of conservation and orderly development. Proper management of these nonrenewable resources requires informed classification of lands, adherence to a policy of conservation, and resolution of any conflicts in land development or use.

The Bureau of Land Management administers the mineral resources under the General Mining Laws, the Mineral Leasing Act of 1920, the Materials Disposal Act of 1947, and other leasing acts which pertain to acquired lands, special areas, and the Outer Continental Shelf.

A minerals study program announced in 1962 called for a comprehensive analysis of the existing and potential mineral resources of the public lands. The basic phase of this "Minerals Inventory" is a preliminary compilation of known geologic and economic data. Excellent progress was made on this compilation, and a continuing analysis to refine the data will be carried on. The total area being studied in the Minerals Inventory is over 480 million acres of public lands in the Western States, including Alaska.

The first phase of this inventory and evaluation of federally owned mineral resources has been completed by 7 of the 11 State offices. The remaining States average 75 percent completion. Detailed analyses are being made of mineral areas slated for intensive

Rockhounds find many treasures on public lands, and with passage of legislation in the fall of 1962, free use of the public lands for rockhounding has been assured while the commercial collection of petrified wood and other collector's materials is regulated.

management or development. There are two products of the initial analysis phase. Maps of individual master units show known or suspected areas of valuable minerals. Summaries of the geology and mineral development furnish supplementary technical information on the areas. These initial reports serve as a tool for land planning and classification and as a base for refining and developing meaningful resource data for the areas.

## Mineral Leasing Active

The administration of mineral leasing for public lands is particularly vital to the Nation's mineral fuel industries. While the greatest activity continues to be in the oil and gas field, other leasable minerals such as potash, sodium, and coal are of major importance in certain States and areas. In addition, disposition of minerals, other than the leasing act minerals, is accomplished by permits and leases for acquired lands.

The activity in simultaneous filings for oil and gas leases continued at a lively rate. The BLM constantly investigates possible abuses of this system. Proposed new regulations, which clearly define what constitutes collusive filings, will deter abuses.

The first leases for oil and gas exploration were issued for the North Kaibab National Forest area in northern Arizona. After much deliberation by the Departments of Agriculture and Interior, the area was opened and 127 leases issued, subject to rigid stipulations to safeguard the area's scenic and wildlife resources.

## Mining Claims and Multiple Use Examined

The Multiple Surface Use Act (Public Law 167, 84th Cong.) authorizes the Bureau of Land Management to determine whether the Government or the miner has the right to manage surface resources of unpatented mining claims on federally owned land. The Bureau has adjudicated such surface rights determinations at the request of the Forest Service for most of the national forest lands. A limited program has been carried out for BLM-administered lands. Additional surface rights determinations will be made as necessary for the proper administration of public land resources. Such determinations are being made to facilitate the Vale project in Oregon and to manage timber areas in Wyoming. Determinations have been completed for 6,705,838 acres of public domain lands.

A mining claim utilization survey was conducted for the 12 Western States, including Alaska. This survey was made to estimate the number of mining claims started, the number currently active, and the use pattern for both patented and unpatented claims. The survey reveals that approximately 6 million mining claims were started in the 90 years between 1872 and 1962 in these 12 States. About 160,000 such claims were active on BLM lands in fiscal 1963. The information from this survey is being analyzed in relation to long-term planning for the BLM minerals program. A review of the number of mineral patents over a 20-year period reveals a direct relation between the volume of patents issued and uranium boom years, which were also periods of high metal periods. A trend toward greater acreage per patent indicates the growing importance of industrial minerals of high volume but low unit value.

For over a year, the Department of the Interior and the Federal Bureau of Investigation have examined questionable applications under the mining laws for over 14,000 acres of public lands near Phoenix, Ariz.

If approved, the mineral patent applications would have allowed the applicants to receive title to the land for $2.50 per acre. Land in the burgeoning Phoenix area is worth up to $200 an acre for subdivision or other purposes.

BLM mining engineers and Arizona State office officials first brought to the attention of Secretary of the Interior that "salting"

A BLM mining engineer makes a mineral examination of an adit near Reno, Ne
The Bureau leases public lands containing mineral resources.

of the mining claims was suspected in the area. "Salting" a claim consists of adding gold to low-yield ore to increase the assayer's estimate of the ore's value.

On April 16, Secretary Udall ordered a "freeze" on pending and future applications. Shortly thereafter, the patent applications for 14,591 acres were voluntarily withdrawn.

It is the responsibility of the Bureau of Land Management to determine, when necessary, the validity of mining claims on lands administered by other Government agencies. During the year, such investigations were carried out of the Department of the Army, the Department of the Navy, the Bureau of Reclamation, the Bureau of Indian Affairs, and the Bureau of Public Roads.

In Arizona, for example, a project was being completed in which validity determinations for approximately 18,000 mining claims on the 2¾ million acre Papago Indian Reservation was undertaken. This work has resolved title uncertainties to mineral rights and has enabled the Papago Tribe to embark on a prospecting permit and leasing program for their lands, which lie in one of the most active areas of the Nation for mining.

Several laws directed toward specific mining claims situations were enacted. Two acts (Public Laws 87–747 and 754) withdrew certain areas in Arizona from mining claim location to facilitate high-value surface development. In these areas the surface had previously been patented, but the minerals were reserved by the Government.

The Bureau of Land Management continued its interest in the modernization of mining laws. The need for such modernization is now generally accepted. In fiscal 1963 a study draft of a general revision was circulated to the mining industry for review and comment.

## Construction Materials Developed

The public lands are the source of much of the materials essential to the construction and roadbuilding industries in the Western States. Fill material, sand, concrete aggregate, lightweight aggregates for building blocks, and clay for bricks are becoming increasingly important. Not generally subject to the mining or leasing laws, such materials are made available by contract sale to companies and individuals and by free-use permits to communities and State agencies. Community pits are being established to make materials available in small lots where needed. New legislation now makes it possible to negotiate sales of materials exceeding $1,000 in cases where public interest dictates rapid consummation of the transactions. Thus, the delay caused by advertising and competitive sales is eliminated.

## New Leasing Office Opened

The first leasing office for the Outer Continental Shelf on the west coast was opened in Los Angeles during the year. The initial offering of oil and gas leases by that office in May resulted in the leasing of 57 tracts totaling over 300,000 acres for cash bonuses of $12,807,587 and $938,838 first year's rental. An earlier offering of nine leases in proven offshore areas by the New Orleans office yielded cash bonuses of $43,887,385, plus $161,780 first year's rental.

Interest in offshore mineral leasing for oil and gas continued high. Technological progress has kept pace with the level of in-

Offshore oil and gas explorations moved forward in 1963 with the sale of several lease off California—the first west coast sale of Outer Continental Shelf leases by the Federa Government. Meanwhile, OCS explorations and drilling in the Gulf of Mexico continue at a high pace.

terest. Rigs capable of drilling in greater water depths and new underwater completion and servicing techniques have been developed. Techniques for extracting other minerals offshore are still in a relatively early stage, but interest is active.

Leasing maps of the entire Continental Shelf off Oregon and Washington were published during the year. These maps extend seaward from the outer limit of the State's jurisdiction to a water depth of 500 fathoms (3,000 feet). Previously issued Outer Continental Shelf maps have been extended only to a water depth of 100 fathoms. Extension to include the greater depths was made at the request of the oil industry which claims that new drilling and production techniques make oil operations feasible at these greater depths.

Areas of Outer Continental Shelf covered by the newly published maps are 5 million acres off Oregon and 3 million acres off Washington.

### Mineral Statistics Listed

The following reflect the scope and importance of mineral activities during fiscal 1963:

| | |
|---|---|
| Oil and gas filings and lease applications | 243, 521 |
| Acreage under lease (including OCS) | 79, 391, 424 |
| Other mineral lease applications | 780 |
| Acreage under lease (including OCS) | 730, 630 |
| Total revenue from mineral leasing on the public lands | 114, 270, 585 |
| Total revenue from mineral leasing (including acquired lands and OCS) | 485, 377, 262 |
| Payments to the States from mineral leasing receipts | 45. 408, 020 |
| Payments to the Reclamation Fund from mineral leasing receipts | 51, 666, 238 |
| Mineral patent applications received | 90 |
| Mineral patents issued | 92 |
| Mineral classification and investigation cases processed | 8, 960 |
| Acreage involved in Public Law 167 determinations (combined Forest Service and Bureau of Land Management) | 26, 694, 172 |

## RESOURCES PROTECTED

An essential part of the management of lands and resources under Bureau of Land Management jurisdiction is to protect them from the destructive forces of nature and the carelessness and willfulness of man. This protection is provided through prevention and suppression of fires, control of forest insects and diseases, prevention and control of unauthorized use, and protection of visitors on the public lands.

Modern techniques and equipment have increased fire-control and aided BLM protection efforts on forested public lands. Here BLM smoke-jumpers descend on a blaze while it is still small.

## Fire Control Improves

Modern techniques and equipment have increased fire-control accomplishments in recent years. However, fire remains one of the principal enemies of our forests, rangelands, and watersheds. During calendar year 1962, the number of fires and the area burned was somewhat less than the average for the past 5 years. A tota of 1,083 fires burned 164,111 acres in 1962, compared to the 5-yeai average of 1,370 fires which burned 444,099 acres annually. Th fire-control objective was to train, organize, and develop a force t hold fire losses to a minimum.

## Fire Conditions Near Normal

Weather and burning conditions were nearly normal for the season. The fire season occurred somewhat later than usual because substantial winter snows and spring rains kept fuels damp. Although this precipitation contributed to the growth of light flammable fuels which could have caused an extreme fire hazard, cool weather through most of the fire season held the moisture content of vegetation high enough to counteract the hazard caused by the abundance of fuels. A near-normal season, combined with aggressive and improved fire-control methods, helped keep resource losses well below the 5-year average.

## Preparedness and Prevention Emphasized

In preparation for the fire season, all equipment and tools were readied and fire guards were assigned to specific areas.

During the past year, training for fire supervisory personnel ncreased. All districts conducted training sessions for Bureau of Land Management personnel, and in many cases sent trainees to cooperative schools conducted by the Forest Service, State fire or forestry departments, and other agencies. The first National Interbureau Fire Behavior Training School conducted by the Department of the Interior was held in January for fire supervisors from several States.

The Bureau also cooperated with other fire-protection agencies in organizing and training specialized firefighting crews. The Southwest Forest Fire Fighters, in Arizona and New Mexico, are Indians and Mexican nationals. They have been available for several years and have proved to be an asset in fire-control work. Training for similar specialized crews started in several other States, including Alaska. Emphasis was on training fire supervisors in organizing and managing men and equipment.

## Suppression Costs $1.5 Million

In 1962, areas burned over included 164,111 acres of Federal land and 186,694 acres of State and private lands protected by the Bureau of Land Management. Damage to Federal lands was nearly $1½ million, and to State and private lands nearly $½ million. Nearly 28,000 man-days were spent fighting fires. Suppression cost was almost $1.5 million. Lightning caused 45 percent of the fires, while in 1961 it had been responsible for 62 percent.

## Alertness Increased

Many advances were made in 1962 and early 1963 in improving detection facilities and constructing new lookouts. These new and improved detection facilities, in conjunction with aerial surveillance, alleviated the danger of fires spreading over a large acreage before detection. Many more facilities and a more complete network of truck trails and roads into large blocks of public land are needed to reach an optimum standard of fire control.

Teaming up to battle a range fire in Idaho, two BLM employees and a local ranch work to bring the fire under control.

## Contract Fire Protection

Private companies, State agencies, and even Federal agencies (such as the Forest Service) sometimes contract to protect BLM lands on a per-acre basis. Lands under such fire protection in Idaho, Montana, New Mexico, Oregon, Washington, and Minnesota experienced a season of near-normal climatic conditions. The average number of fires per year for the past 5 years was 248. There were 261 fires in 1962. During the 1962 season, 67 percent of all fires on lands protected by contract were man caused, while in 1961 the figure was 25 percent. This comparison emphasizes the need for continued expansion of the fire-protection program.

## Air Operation

The use of the Bureau's aircraft in fire-control activity is increasing each year. Nearly 300,000 gallons of fire-retarding slurry were dropped on fires suppressed by the Bureau, with positive results reported on 91 percent of all aerial drops. The slurry was bentonite and sodium-calcium borate.

Helicopters were used for accurate droppings of small amounts of fire-retardant slurry, for transportation of men and tools, for

Dropping half of its 1,000-gallon load of fire-retarding borate on a forest fire near Bettles, Alaska, this converted B–25 bomber operates under contract with the Bureau of Land Management to help control forest fires in the far north.

fast initial action of fires in remote areas, and for shuttling men and equipment on the fire line of large fires.

## Unauthorized Use Controlled

Unauthorized use is a chronic problem in public land management. The BLM has a two-part program to control unauthorized use. The public is informed of the facts and dangers of trespass and a vigorous program of enforcement and control is maintained.

A backlog of 1,375 known trespass cases of various types existed at the beginning of fiscal 1963. During the year, 1,358 new cases developed, making a workload of 2,733 cases. Of this total, 1,982 cases were closed, leaving a backlog of only 751 cases. These trespass cases range from the unintentional to the criminal, and are widespread in all the public land States.

## Disease Control Pushed

The most serious tree disease affecting timber on land administered by the Bureau of Land Management is white pine blister rust, common to all five-needle pines. Eradication of the alternate host plant remains the principal measure for control of the disease, which is most widespread in northern Idaho, northern California, and western Oregon. The alternate hosts for white pine blister rust are several species of a shrub of the genus *Ribes*. Eradication of *Ribes* was conducted on forest lands in Oregon, where sugar pine is the major species of commercial timber. During the 1962 field season, 83,000 *Ribes* plants were destroyed on approximately 560 acres.

Two additional possibilities for controlling white pine blister rust appear promising. One is the treatment of infected sapling and pole-size trees with an antibiotic. During the 1962 field season, 20,708 trees were treated on 142 acres. Antibiotic treatments are still in the experimental stage. The other possibility is the breeding of rust-resistant seedlings. This involves locating rust-resistant trees, controlling pollination by placing bags over the cones, and obtaining seeds that will produce rust-resistant stock The Bureau of Land Management installed bags on 94 sugar pine and 26 western white pine. Eventually, either the antibiotic treatment or the rust-resistant trees will eliminate the control system o grubbing or chemically treating *Ribes*.

## Insects Create Problem

Insect attacks are difficult to detect before they have reached epidemic proportions, thus making control difficult. Annual timber damage by insects is many times greater than by fire.

The BLM carried out bark beetle control projects in Wyoming, Colorado, and California. Approximately 22,000 trees on more than 6,000 acres were treated. A control project was started in Montana for a spruce budworm infestation. Adequate control of these infestations will require several years.

## More Visitor Protection Required

Increasing public use of the public lands for recreation places greater requirements on the visitor protection program.

The Bureau's visitor-protection objective is to identify, isolate, and correct hazards that threaten the general welfare and safety of citizens enjoying the public lands. Visitors should be guided to

Wayside shelters and sanitation facilities are provided on recreation sites as part of BLM's visitor protection program.

areas of natural interest and warned of hazards. Wayside shelters and sanitation facilities should be provided. A basic search-and-rescue organization should be developed for emergencies.

# ENGINEERING GAINS LISTED

Surveying the public lands is the oldest activity of the Department of the Interior. The U.S. rectangular system of public land surveys was the first technically designed and nationally coordinated cadastral survey system in modern history. It is essential to all public land transactions.

## Many Areas Still Unsurveyed

Outside Alaska some 112 million acres of public land remain unsurveyed. Much is under permanent withdrawals and until recently little or no demand for surveys had been anticipated. However, there are indications that some unsurveyed land, particularly in the national forests, has an exchange value which can be used to consolidate and improve the management of Federal lands. Because only surveyed public land can be used for exchange purposes, requests for original surveys are increasing.

For practical purposes the survey of common school sections outside reservations is complete with the exception of school sections in California. School sections in reservations cannot be acquired by the State upon survey. However, the States normally can select "lieu" public lands to compensate for the loss of school lands in reservations. Because of the large quantity of unselected lieu lands remaining to the credit of Utah, a demand for surveys in that State is effected so unsurveyed lands can be made available for selection.

## Resurveys Needed

Resurveys are needed principally because much of the evidence of the original surveys, made 50 to 150 years ago, has either dis appeared or is becoming difficult to identify. In the extensive farming areas, the first settlers quickly erected fences or con structed roads along their common property lines. These line have been perpetuated. But in the more remote areas, many boundaries of lands taken up for stockraising or other nonintensiv

Range fencing in eastern Nevada, supervised by the Bureau of Land Management with employees hired under accelerated public works programs, aids in land management.

uses have become obliterated. This condition has resulted because of the ravages of time, impermanent original monuments, and such forces as erosion, animals, and man.

Since in many of these areas private land is intermingled with public land, it is becoming increasingly important for management and administrative operations to identify the boundaries of the public lands. The private landowner also benefits indirectly from these resurveys, since the boundaries of his land common with the public land are resurveyed and marked at the same time. The generally increasing value of real estate also contributes to the demand for resurveys.

A large number of special-purpose resurveys were made during the year in the BLM's valuable timberlands to gather information for timber sales and to detect timber trespasses for civil or criminal prosecution. Resurveys were also made to locate areas suitable for multiple use under mining laws and the land laws.

Well underway in fiscal 1963 were cooperative projects with the Forest Service to remonument public land survey corners of the boundaries of the western national forests. Under a cooperative agreement, Forest Service personnel search for original survey corner evidence, and BLM cadastral engineers examine this evidence and accept or reject it as a genuine survey marker. If accepted, the corner evidence is perpetuated by a BLM standard brass-capped iron post. Such marker reestablishment becomes part of the official survey records.

## Alaska Surveys Increase

Some 360 million acres of public lands are unsurveyed in Alaska Because of remoteness, climate, and physical characteristics o terrain, much of this area need never be surveyed.

Surveying in Alaska has been concentrated on those lands selected by the State under the terms of its entry into the Union The new State was granted over 103 million acres, with the right to make selections over a 25-year period.

To meet these State selection needs, the Bureau of Land Management increased its surveying organization in Alaska. Field work was accelerated to meet a yearly survey requirement goal o 4 million acres—the average needed to provide transfer of the 103 million acres to the State in the stipulated period.

Under the Statehood Act, the Bureau has surveyed only exterior boundaries of approved selections at intervals averaging 2 miles.

In the expanded program in Alaska, new survey techniques have been developed and used. These involve electronic distance measuring devices, photogrammetric procedures, and improved instruments.

## Trails and Roads Program Starts

Resource management for the public lands requires that acces be provided to remote areas. A Public Lands Development Road and Trails Program has been started and a transportation plan fo each State has been developed. This is the initial step in developing a road system in the Bureau to facilitate accelerated management programs.

Continued efforts have been made toward the standardizatio of buildings and other structures incorporated in the Bureau construction program.

The program to provide usable maps for resource managemen techniques continued satisfactorily.

attle water at a tank near Idaho Falls, Idaho, on public lands administered by BLM.

A handbook was published to standardize signs and further their se to help inform the public of the Bureau's work. A handbook n development of roads and trails on the public lands is planned.

## ommunications Expand

Radiocommunication services expanded throughout the year. typical accomplishment was the extension of such communicaions to an area of 300,000 acres of range and timber lands in Monana. In practically every State, new areas of public lands were opened" to communications essential to fire prevention and control. he Bureau improved this important service by developing its own ircraft radio transceiver.

Not all progress has been restricted to systems engineering. esearch—some performed jointly with other agencies—advanced n the presuppression and fire-detection field. A spherics (electrial storm) detection and tracking system, aerial infrared fire deection, automatic weather observation and reporting service and everal thermoelectric generating devices were under study. The pherics tracking system in scheduled to be installed in Alaska in 965.

As part of the Department of the Interior's far-reaching program of conservation education, a group of school teachers attending a conference in Colorado were taken on tour of some public lands in the Gunnison River Valley.

# PERSONNEL TRAINING ARRANGED

Major emphasis in Bureau of Land Management personnel operations was on training and developing top supervisory personne in leadership and personnel management. Most BLM State Directors attended the Summer Institute in Executive Development fo Federal Administrators at the University of Chicago. There wa a substantial increase in participation by employees at the Montana State University School for Administrative Leadershi

Thirty-four range conservationists took a refresher course at Utah State University.

For the second successive year, two employees attended the University of Michigan, taking courses in Natural Resource Development and Policy Analysis for which they received masters' degrees. Approximately three times as many employees were trained through interagency and inter-Bureau courses and through private agencies outside the Government. They took courses in real estate appraisal, fire behavior, supervisory development, trespass, and many other subjects. One week of orientation on Bureau functions was given 260 new professional employees.

In accordance with the President's Executive Order 10988, Employee-Management Cooperation in the Federal Service, a plan was developed for fully recognizing rights of employees and their organizations.

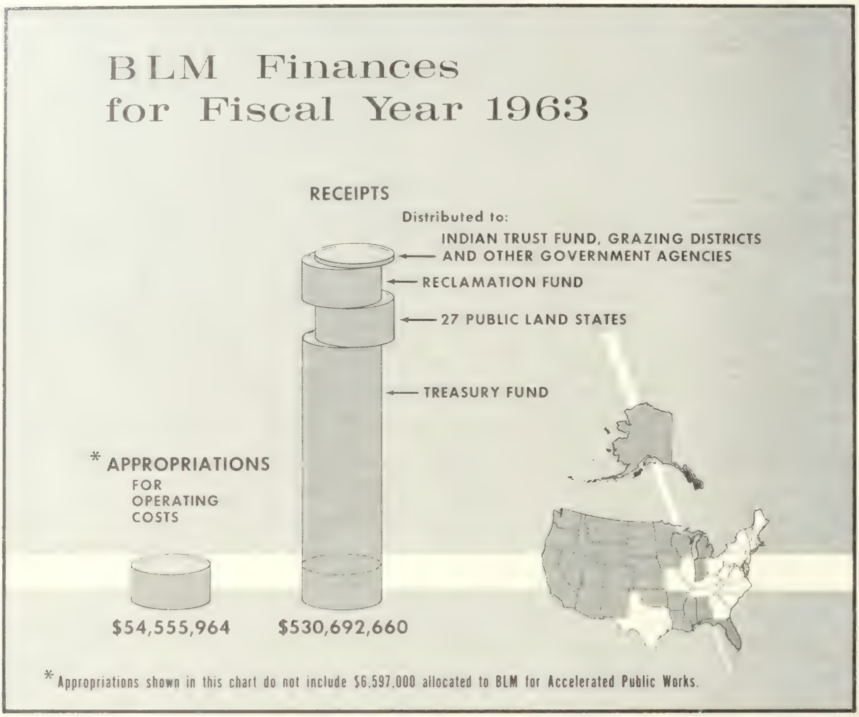
The Employee Handbook was revised, a comprehensive recruiting pamphlet on Careers in the Bureau of Land Management was published, and a pamphlet on summer employment was issued.

In the field of safety, frequency rate of disabling injuries declined 30 percent. Similarly, there was a reduction in the frequency of preventable motor vehicle accidents. The direct cost of all accidents per employee dropped from $45.13 in 1959 to $16.22 in 1962. Many short training sessions were held in fiscal 1963, and a Safety Handbook was prepared to promote accident prevention.

Emphasis on economic reforms, including land reform, in the United States foreign programs created increased demands for technical assistance from the Bureau of Land Management. Many of the Bureau's methods in the survey, distribution, and management of land in developing areas can be applied directly, or with modifications, to other countries.

Opportunities were provided for over 60 nationals of 15 countries to investigate the public land policies and programs which have played a major role in the security and development of the United States. Nine former Bureau cadastral survey, land, and range management officials were on assignment with the Agency for International Development.

Technical consultation in all areas of the BLM's operations was provided nationals of nearly all free world countries.



* Appropriations shown in this chart do not include $6,597,000 allocated to BLM for Accelerated Public Works.

## RECEIPTS TOTAL $530 MILLION

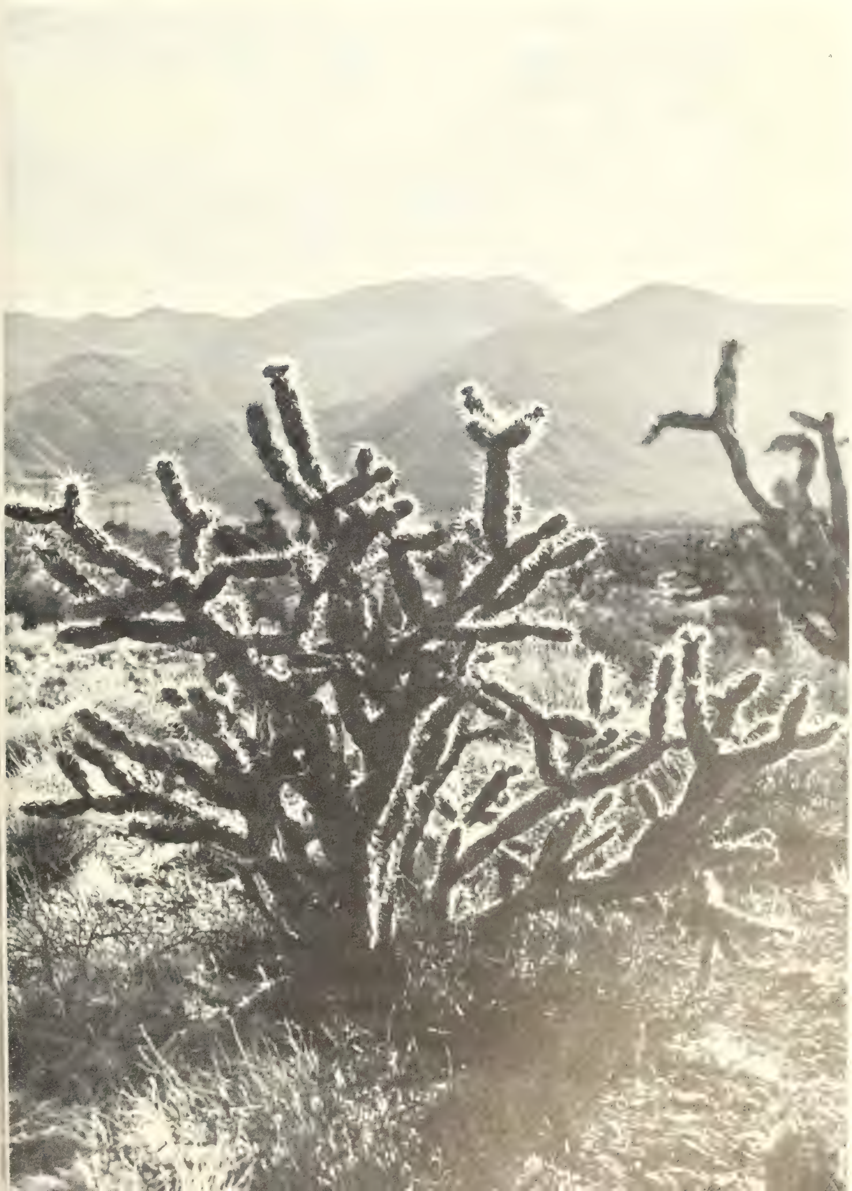
Appropriations during fiscal 1963 for operations of the Bureau of Land Management were: Management of lands and resources, $44,410,200; construction, $1,000,000; O & C grant lands, $7,703,025; range improvements, $696,525; and Public Lands Administration Act, $746,214. In addition, $6,537,000 was allocated the Bureau under the Accelerated Public Works program.

During the year the Bureau received from the sale and management of public lands and resources a total of $530,692,660. These came principally from mineral leases and permits; timber sales; sales of public lands and materials; grazing leases, licenses, and permits; fees and commissions; and leasing of rights-of-way.

Receipts of the Bureau of Land Management for fiscal year 1963 were distributed as follows: $209,355 for Indian trust funds; $1,200,000 returned to the grazing districts for range improvements; $4,099,437 transferred to other Government agencies; $55,521,101 deposited to the reclamation fund; $61,051,134 to 27 public land States (of which $15,031,270 went to the 18 western Oregon timberland counties) ; and $408,611,633 to the general fund of the U.S. Treasury.

Receipts of BLM and its predecessor agencies total $3,127,222,993. Since BLM was established in 1946, receipts have totaled $2,390,577,840.

Spiny cholla cactus is one of the picturesque plants found on arid BLM lands of the southwest.



# National Park Service

## Conrad L. Wirth, Director

On August 22, 1962, the one billionth visit to the national parks was recorded since the first visit in 1904. At the current pace, the second billionth will be reached in 11 years.

The National Park System affords Americans opportunities to enjoy great scenic and inspirational areas of their country in a natural, unspoiled condition and the rare quality of the primitive wilderness that was America before it was touched by civilization. They may better comprehend the physical and spiritual links that bind America's past to its present and future and they may find release from the care and tension of the workaday world.

The supply of outdoor recreational facilities and opportunities is proving inadequate in both number and distribution to meet the increasing demand. The Nation's burgeoning and mobile population will be hard put to find extensive areas of open space. But it will be the Federal, State, and local parks that will bear the burden: Several thousand recreation seekers cannot be satisfied in a park designed to accommodate several hundred.

Secretary of the Interior Udall cautioned that "the least we can do . . . before our land patterns become inalterably fixed . . . is to preserve the few remaining extensive areas of natural open space . . . now, while there's still time."

The Service is providing more and better opportunities for Americans to visit, understand, and fully enjoy their great natural, historic, and scientific heritage. While holding to the traditional concept of preserving wilderness values as completely as possible the National Park Service, during fiscal 1963, made great strides in modernizing its services to the public. These improvements are evidenced in better access roads, more trails for hiking and horseback riding, more campgrounds, more and better visitor accommodations, and more modern and imaginative interpretive facilities.

The National Park Service in fiscal 1963—

> . . . Welcomed a new high of 91,496,000 visitors to the National Park System and recorded 6,106,000 camp-use days—a startling 21-percent gain over fiscal 1962.
>
> . . . Saw three areas established as units of the park system: Petrified Forest National Park, Ariz.; Fort Clatsop National Memorial, Oreg.; and Bents Old Fort National Historic Site, Colo. The Service also welcomed the authorization of six areas including national seashores at Point Reyes in California and Padre Island, Tex.; three national historic sites—Theodore Roosevelt Birthplace and Sagamore Hill, both in

Bent's Old Fort National Historic Site, near La Junta, Colo., one of the three new area established during fiscal year 1963, preserves the remains of one of the West's mos significant fur-trading establishments.

New York, Fort Saint Marks, Fla., and the Frederick Douglass Home, a unit of the National Capital Parks.

. . . Cooperated in important special studies of the North Cascades region in Washington State, the Coast Redwoods region in California, and a comprehensive park and recreation area study of Hawaii. In addition, the Service is also cooperating in a special Wild Rivers Study being conducted jointly by the Departments of Agriculture and Interior.

. . . Saw the long-range requirements program, which began in 1956 with Mission 66, enter a new phase with the assignment of a task force to chart the future course of both the Service and the National Park System.

. . . Received from Congress $13,622,000 to purchase privately owned lands urgently required for recreation, conservation, development, and construction purposes in 24 long-established areas and 7 newly authorized ones.

. . . Accomplished a construction effort in which more than 90 percent of all programed projects either had been completed or were being built.

he new Visitor Center, Dinosaur National Monument, Utah-Colorado, one of the nine ew visitor centers opened during the fiscal year, is an example of creative architecture aking its appearance in the National Park Service.

. . . Highlighted the release of the Secretary's Specia Wildlife Advisory Board Report on March 4, 1963, whose wildlife management recommendations were subsequently accepted and implemented in the program.

. . . Opened or installed 9 new visitor centers and installe more than 150 exhibits.

. . . Moved the Horace M. Albright Training Center t newly constructed facilities at Grand Canyon National Park

. . . Raised to 404 the total number of sites eligible fo status in the Registry of National Historic Landmarks.

. . . Increased attention to the equal opportunity progra and to the employment of women in types of positions fo which they are particularly suited, such as park guides an park interpreters.

. . . Issued an unprecedented number of factual report and publications to the general public.

. . . Processed, through its Division of International Cooperation, more than 2,000 letters of inquiry from foreig countries.

. . . Recorded more than 7 million visits to units administered by the National Capital Parks.

## PARK ATTENDANCE AT NEW HIGH

National Parks registered a total of 91,496,000 visits. This record figure was an increase of 11.2 percent over fiscal 1962—an more than doubled the volume of park visits of 11 years ago, an tripled the statistics of 15 years back.

National Park Service statisticians forecast that the existin developed parks will experience 100 million visits during the Service's Silver Anniversary year, 1966. As new recreation areas an seashores are developed, a 1966 figure substantially greater tha 100 million may be confidently expected.

The camp-use days—6,106,000 during fiscal 1963—were 21 percent above those recorded during the previous period. That camping is no longer the nearly exclusive preserve of the family unde a canvas tent on the ground emerged from a special survey mad during 1962. It showed that of every 100 camping partie slightly more than 50 use this equipment. Nineteen camped i house-trailers, seven in tents erected on trailers, six in campe coaches, six in station wagons or specially equipped buses, three i tiny sleeping trailers, and eight utilized more unusual equipment—or none at all.

Becoming more popular is the use of house trailers as a means of camping. Nearly all Park System areas provide for the camping families using house trailers.

Park concessioners and private in-holders operating commercial accommodations recorded 2,944,000 overnight stays, or 8.7 percent above fiscal 1962—the largest relative increase in more than a decade.

## New Parks and National Seashores Authorized or Established

Three new areas were established and six areas were authorized for addition to the National Park System during the year.

Petrified Forest National Park, Ariz., became the Nation's 31st national park December 9, 1962, when Secretary Udall issued an

One of the two new national seashores authorized by Congress during fiscal year 1963, Point Reyes National Seashore, Calif., will provide outdoor recreation for one of the most heavily populated and fastest growing regions in the Nation.

order redesignating the Petrified Forest National Monument as a national park. A 1958 act had provided that this be done as soon as the non-Federal holdings, totaling 8,174 acres, were acquired by the Federal Government.

Fort Clatsop National Memorial, Oreg., commemorating the Lewis and Clark Expedition to the Pacific coast, was established October 18, 1962.

The site of a historic fur-trading enterprise located on the mountain route of the Santa Fe Trial in Colorado—Bents Old Fort—was established on March 15, 1963, as Bents Old Fort National Historic Site.

Two national seashores were authorized by Congress in recognizing the need to preserve additional portions of our rapidly vanishing seashore. They were Point Reyes National Seashore, Calif., authorized September 13, 1962, and Padre Island National Seashore, Tex., authorized September 28, 1962.

Four historic sites were also authorized for inclusion in the National Park System. They are the Theodore Roosevelt Birthplace National Historic Site and Sagamore Hill National Historic Site, both authorized July 25, 1962, to preserve in Federal ownership these historically significant properties in New York State, which were associated with the life of President Theodore Roosevelt; the Frederick Douglass Home, District of Columbia, authorized September 5, 1962, as a unit of the National Capital Parks, to preserve the home of this noted Negro leader; and Fort Saint Marks National Historic Site, Fla., authorized October 10, 1962, to protect the site where several successive forts were built, starting about 1679.

# CONSERVATION, INTERPRETATION, AND USE GAIN

Park and visitor protection continued to receive the highest priorities in all areas of the National Park System. Conservation of the unique, natural, and primitive values, together with provision for public recreational enjoyment of the esthetic and historic values by more than 90 million visitors, were enhanced through intensive planning, organization, and development.

## Wildlife Management

Release of the Secretary's Special Wildlife Advisory Board Report, the subsequent acceptance of its recommendations, and implementation of activities highlighted the wildlife management program in the national parks. A review of current and future national park wildlife programs was prepared so that a stepped-up program of cooperative understanding, study, and management of migratory animals might be resolved through increased contacts with other conservation agencies.

There has been a significant need to preserve park values through increased wildlife management. These included the establishment of wildlife control programs which, in fiscal 1963, involved relocation of 2,079 large mammals and the necessary reduction of 4,992 animals.

Cooperative fisheries studies continued and fish planting programs were carried out in 13 areas.

## Training Increases

The Horace M. Albright Training Center (formerly the National Park Service Training Center) was relocated in new facilities at Grand Canyon National Park, Ariz. Nearly 300 members of the uniformed staff completed the concentrated 3-month orientation and indoctrination training program.

## Forest, Soil, and Water Problems Attacked

During fiscal 1963, a record 609 fires burned 79,252 acres inside park areas and 115,088 acres in protection zones outside

The Horace M. Albright Training Center was relocated in new facilities at Grand Canyon National Park, Ariz.

park boundaries. Approximately 50 percent of these fires were man caused. The Service spent $261,029 in fire-suppression activities. To counter additional fire damage, the Service enjoyed the continuous and effective cooperation of other land-management agencies. An interdepartmental fire behavior school was held in California.

Control continued against epidemic outbreaks of forest pests in developed and concentrated visitor-use areas. The program included protection of outstanding or rare plant species and plant communities.

Soil and moisture conservation programs, undertaken to restore depleted or previously misused land, vegetation, and water resources and to restore natural conditions, were conducted in 20 parks. A conservation survey on 225,000 acres of depleted wildlife range in Yellowstone National Park started. Cooperative activities with local soil and water conservation districts and other agencies increased.

## New Visitor Centers Opened

Nine new visitor centers were opened: Antietam National Battlefield Site, Md.; Pea Ridge National Military Park, Ark.; Chancellorsville Battlefield, Va.; Lehman Caves National Monument, Nev.; Fort Clatsop National Memorial, Oreg.; Petrified Forest National Park, Ariz.; Christiansted National Historic Site, Virgin Islands; Vanderbilt Mansion National Historic Site, N.Y.; and Big Bend National Park, Tex.

## Exhibit Installations Added

Park visitors find exhibits—both in the visitor centers and along the roads and trials—help them understand and enjoy the parks. Durable, self-operating, accurate, and attractive exhibits afford an economical and effective aid to interpretation. During the year the Service installed over 150 exhibits in the 9 new visitor centers. It added, updated, or rehabilitated nearly 100 exhibits in 15 established visitor centers. At year's end, exhibits were in production for six more. The Service experimented successfully with new methods of improving the design and durability of outdoor exhibits. In the process, over 50 new ones were installed in 8 parks.

## Interpretation Activities Gain Specimens

The heart of good exhibits are the specimens they display. The Service's important collections of historic and scientific objects—the

Park visitors find exhibits in the visitor centers and along the roads and trails help them to understand better and enjoy the parks. This unique outdoor exhibit at Badland National Monument, S. Dak., is a glass-enclosed "fossils-in-place" display.

pay dividends in the preservation and administration of the parks in return for the expert care they require.

The Service continued to refine its collections by adding significant and necessary new material while disposing of specimens not useful to the parks. The outstanding accession was Benjamin Franklin's desk, purchased at auction for Independence Nationa Historical Park with the aid of the Eastern National Park and Monument Association.

The Service received numerous gifts of specimens for the American Museum of Immigration, the Museum of Westward Expansion, and for other park museums across the country.

## Training Programs Developed

Improvement of opportunities for visitors to understand an enjoy their national parks increased. Sixteen new naturalist pos tions were filled during the year. Two new training programs fo improving the quality and effectiveness of performance in interpretive programs were started. One was the opening of the Stephen T. Mather Interpretive Training and Research Center at Harpers Ferry, W. Va.; the other was use of demonstrations and training sessions at campfire programs. Results will be evaluated as a possible continuing training method. A committee was established to develop and evaluate new ideas and devices for interpretation.

## Concession Installations Improved

New concession contracts were approved for Yosemite, Blue Ridge Parkway, and National Capital Region, in addition to Independence and Castillo de San Marcos. A major feature of the new concession contract at Yosemite was a $2 million construction commitment for new and improved visitor accommodations. Offers were invited for concessions at Flaming Gorge, Glen Canyon, Great Smoky Mountains, and Cape Hatteras.

Important concessioner investments were made at Grand Canyon (South Rim), $388,347; Lake Mead, $134,264; Petrified Forest, $116,038; Sequoia and Kings Canyon, $388,403; Shenandoah, $196,854; Grand Teton, $334,581; Independence, $207,269; Castillo de San Marcos, $245,699; and Yosemite, $622,412. Additional projects by concessioners were underway or were planned at Blue Ridge, Big Bend, Mammoth Cave, Olympic, and Glen Canyon.

## Pilot Project Used

An integrated training program for first- and second-line supervisors was developed and presented. Also, as a pilot project, students were hired from a 2-year technical school to evaluate education in fields of horticulture, construction, and engineering in terms of our needs and efficient manpower utilization. The Service believes that such graduates offer great potential to improve personnel.

## Sanitation Poses Problem

As the number of visits increases throughout the National Park System, the problems of littering and sanitation removal and disposal costs increase. During the year, the Park Service, along with the Forest Service, published a litterbug poster for use in all national parks and national forests. This seeks to develop a cooperative attitude toward keeping such areas clean. A study was

The National Geographic Society donated $50,000 for Wetherill Mesa research at Mesa Verde National Park, Colo. This is the Cliff Palace at Wetherill Mesa.

started on disposal methods and practices to be used in national parks.

### Historical Interpretation Advances

The Sound and Light programs, started in fiscal 1962 at Independence National Historical Park and Castillo de San Marcos National Monument, were in full operation and awaited complete evaluation of public acceptance. Proposals to extend such service to other areas were held in abeyance pending evaluation.

### National Survey of Historic Sites and Buildings Active

Studies were completed in 6 basic themes of American history while 93 sites and structures were classified as having exceptiona value and were approved as eligible for the Registry of Nationa Historic Landmarks. They brought the total to 404.

## Archeological Research Conducted

Archeological research was carried out in 22 Service areas. Major projects were started at Grand Portage, Mound City, and Mount McKinley. Other projects began or were continued at Hopewell Village, Chalmette, and Mesa Verde. The National Geographic Society donated another $50,000 for Wetherill Mesa research at Mesa Verde.

## Salvage Archeology Widely Supported

Extensive salvage archeology in reservoir areas continued through financial cooperation with other Federal agencies and State and local institutions. The Smithsonian Institution, with funds from the Service, operated 16 field parties in the Missouri River Basin. Under cooperative agreements, 41 other reservoir areas were investigated by 27 different institutions. Valuable scientific information is constantly being gathered by projects in the National Park Service areas and salvage areas. This is proved by the receipt of 91 research reports on such projects.

# DESIGN AND CONSTRUCTION SET RECORD

The construction program exceeded that of any previous year. The Service has plans for 2,343 construction projects totaling more than $152 million. These include recreational facilities in the Upper Colorado River Basin Reservoir areas. An additional $2 million was programed for exhibits, interpretive devices, rehabilitation projects, and advanced planning. The Service managed 332 projects totaling $7,936,000 under the Public Works Acceleration Act in 42 counties or election districts in 21 States, Puerto Rico, and the Virgin Islands. They were in 35 parks, monuments, or recreation areas administered by the National Park Service.

The close of fiscal 1963 marked the end of a most successful construction effort of the Office of Design and Construction. At that time, more than 90 percent of all programed projects either had been completed or were under construction. Those projects programed, but not underway at that time, were delayed because of unforeseen exigencies such as land acquisition, archeological research, and master plan preparation and approval.

Planning was completed for projects programed for construction during fiscal 1964. Emphasis was on providing more visitor facilities in established and newly acquired areas. Some of the more nificant projects will provide new or additional facilities to visitor developments in Blue Ridge Parkway, Dinosaur, Wind Cave, Grand Teton, Yellowstone, Big Bend, Saguaro, Zion, Death Valley, Lava Beds, and Sequoia-Kings Canyon; initial development of recently established areas as Fort Davis, Whiskeytown, and Cape Cod National Seashore; and complete programed development in a single year of such areas as Fort Raleigh, Gila Cliff Dwellings, Glacier Bay, Sitka, and Hamilton Grange. Continuation of long-range construction projects, such as archeological surveys, excavation, and ruins stabilization in Mesa Verde and dune and beach stabilization at Cape Hatteras National Seashore, are also contemplated.

## Architectural Appeal Stressed

Completion of the Petrified Forest Community by the internationally known architects, Neutra and Alexander, is an example of outstanding environmental architecture. Faithful adherence to authenticity characterizes the continuing and most satisfactory restoration of buildings in Independence Square. The substantial contributions of individuals, universities, and municipalities in money, facilities, and drawings has increased the accomplishments of the Historic American Building Survey and the resulting archival material.

The prototype Wisconsin Catalog of historic buildings, designed for visual understanding and of broad interest to both the scholar and the lay public, approached its final stage. Interest by States and universities could result in a complete 50-State series.

## Division of Construction Created

The Division of Construction, responsible for construction policies and contract administration, was created late in the year and is expected to play an important role in the National Park Service.

## Engineering

The Division of Engineering supervised more than 1,600 projects, totaling $41,730,300, in 168 areas in 40 States, the Virgin Islands, Puerto Rico, and the District of Columbia.

Of particular significance was participation with the Federa Aviation Agency in constructing public airports in the vicinity of Yellowstone National Park and Grand Canyon National Park (South Rim). Both airports will become operable during 1964 and will permit scheduled airline service to the parks. They also will aid in administration and protection of the areas. A survey was being conducted to determine Service requirements for similar facilities in or near other areas it administers.

Development of recreation facilities at reservoirs in the Upper Colorado River Basin continued. Visitor facilities, such as campgrounds, picnic grounds, marinas, and boat-launching ramps and utilities systems, are included in the present construction program of 45 projects totaling more than $1,980,181 at Crawford, Flaming Gorge, Glen Canyon, Paonia, Steinaker, and Navajo Reservoir Recreation Areas.

Provision of visitor facilities, including construction of campgrounds and picnic areas, was stressed. Underway were 376 projects, totaling more than $12 million in 69 areas in 31 States. They will provide more than 9,000 new campground sites, approximately 2,400 picnic area sites, and the rehabilitation of 945 campground sites. Included in this total were 96 roads and trails projects, 108 utilities projects, and 27 miscellaneous projects to serve these visitor facilities. In addition to roads and trails projects to provide access to campgrounds and picnic areas, 440 roads and

Visitor facilities, including boat-launching ramps and marinas, are part of the construction program of 45 projects. Water skiing is a popular water sport on Lake Powell now lling above Glen Canyon Dam in the desert country of Utah and northern Arizona.

trails projects, totaling more than $13,104,243, were scheduled for construction in 108 national parks, national monuments, and national recreation areas in 35 States. Storm damage repairs to dunes and beaches in Cape Hatteras National Seashore, and repairs to flood-damaged trails in Sequoia-Kings Canyon were also made.

The Service scheduled 509 projects totaling more than $8,225,056 for miscellaneous construction items in 168 parks, monuments, and recreation areas in 40 States.

More than 300 utilities construction projects totaling $8,527,873 in 114 national park areas, were underway or being readied.

Conversion of National Park Service radio systems to narrow band frequencies was completed or was underway at 15 parks, parkways, monuments, and the National Capital Region. Installation of new radio systems was completed or started at nine parks and monuments. Commercial electric powerlines were extended to supply power to the following: Colorado, Jewel Cave, Theodore Roosevelt, Capulin Mountain, Great Sand Dunes, Hovenweep, Death Valley, Mount Rainier, and Olympic. Construction of a commercial powerline into Death Valley National Monument culminated many years of negotiations.

## Landscape Architecture Reaches Many Areas

A $16 million contract authorization for landscaping was distributed as follows: Baltimore-Washington Parkway, $166,100 Blue Ridge Parkway, $6,604,300; Colonial Parkway, $343,200 Foothills Parkway, $86,700; George Washington Memorial Parkway, $1,480,500; Natchez Trace Parkway, $4,185,400; Rock Creek and Potomac Parkways, $2,933,800; and advance planning $200,000.

Fifteen major projects totaling $10,900,000 were completed They included 45 miles of paving, 29 miles of grading, 12 grade separations and bridges, and 1 tunnel. On the Blue Ridge Parkway, a 20-mile section was opened from Beech Gap to Balsam Gap where the parkway road reaches its highest elevation, 6,050 feet at Richland Balsam. Its opening provides continuous travel wes of Asheville from Pisgah Inn through Wagon Road Gap 60 miles to the southern terminus at Great Smoky Mountains Nationa Park.

Thirty-nine contracts totaling approximately $25 million were in progress under the Bureau of Public Roads. They included 5 miles of paving, 63 miles of grading and base course work, 4 bridges and grade separations, 8 tunnels, and other road-improvement work. About $4,874,000 worth of construction was concen

Fifteen major parkway contracts were completed during fiscal year 1963, including paving of roads, grading, and construction of bridges and road separations. This bridge construction on the Blue Ridge Parkway was among those just completed.

trated on the final link of the Blue Ridge Parkway in Virginia around the city of Roanoke, and $6,310,000 on the sections west of Asheville between Pisgah Inn and U.S. Highway 25. Both sections are expected to be ready for the 1965 travel season. Work started on 4½ miles of the 11-mile section around Asheville. The Asheville gap and the 5½ miles around Grandfather Mountain, for which right-of-way has not been acquired, are the only stretches of the 469-mile parkway not yet started. Reports prepared by the Bureau of Public Roads and the National Park Service were completed for the Great River Road in Iowa and for Parts I and II in Minnesota, containing recommendations for land acquisition, scenic easement, and control of access. Studies for similar reports were underway in Arkansas, Wisconsin, and Illinois.

## Parkways Improved

The Branch of Parkways, in collaboration with the Bureau of Public Roads, continued studies on several proposed national parkways:

**Blue Ridge Extension into North Carolina and Georgia (190 miles).**—A favorable report was prepared and submitted to Congress by the Departments of Interior and Commerce.

**Allegheny Parkway (550 miles), Maryland, West Virginia, Virginia, and Kentucky.**—Field studies started. The report is scheduled for completion in fiscal 1964.

**New River Parkway (99 miles), West Virginia.**—Field studies nearly completed and the report to the Area Redevelopment Administration is in preparation.

**George Washington Country Parkway (184 miles), Mount Vernon to Yorktown, Va.**—Field studies continued.

About $6,850,000 of roadwork was contracted for.

Most of the 75 miles of roadwork completed was reconstruction of existing routes. Principal jobs completed were at Glacier, Grand Canyon, Crater Lake, and Mount McKinley. One outstanding section of new road was built as the through scenic highway at Capitol Reef.

### Master Plan Coordination Developed

A new concept, the "Package Master Plan," was adopted. It combines into one document all narrative and graphic material necessary to assure continuity in managing and developing a park. This system involves the simultaneous study by a team of men oriented and experienced in master plan concepts. They prepare this document in the park in conjunction with the park staff.

This method will help bring master plans up to date and keep them current. Following adoption of the system in fiscal 1963, five complete master plans were submitted and approved, while numerous others were under preparation. Among those completed are three for new parks so public use facilities can be provided soon after the areas have been established. These include Cape Cod, Bents Old Fort, and Fort Davis. In preparation are those for Hamilton Grange, Lincoln Boyhood, Padre Island, Point Reyes, Sagamore Hill, and Theodore Roosevelt Birthplace.

## PLANNING PROGRAM ACTIVE

The planning program seeks the selection for preservation—while still available—of those outstanding scenic, scientific, historic, and recreation areas which are of national significance so that park needs may be fulfilled. This program is urgent because the cost of the most desirable areas is rapidly increasing and the opportunities to preserve the best remaining areas are diminishing as such areas are taken for industrial, commercial, residential, and other forms of development.

Reports were completed on comprehensive planning studies of 16 major areas suggested for addition in the National Park System, including Big Horn Canyon, Montana-Wyoming.

Significant planning progress was made during the year. The extensive planning work required to prepare suggestions for legislative consideration continued on 37 proposed projects. Reports were completed on the comprehensive planning studies of 16 major areas suggested for addition to the National Park System. Among these were Bighorn Canyon, Mont.-Wyo.; Buffalo River, Ark.; Congaree Swamp, S.C.; Guadalupe Mountains, Tex.; John Muir Home, Calif.; and Longfellow House, Mass. Field investigations of about 30 additional areas were made, in various degrees of detail, to determine whether they were of national significance.

The Department announced its support for establishing the following: Allegheny Portage Railroad National Historic Site, Pa.; Canyonlands National Park, Utah; Fire Island National Seashore, N.Y.; Fort Bowie National Historic Site, Ariz.; Fort Larned National Historic Site, Kans.; Fort Union Trading Post National Historic Site, N. Dak.-Mont.; Great Falls Park (part of George Washington Memorial Parkway), Va.; Hubbell Trading Post National Historic Site, Ariz.; Ice Age National Scientific Reserve, Wis.; Johnstown Flood National Memorial, Pa.; Oregon Dunes National Seashore, Oreg.; Ozark National Rivers, Mo.; Poverty Point National Monument, La.; Prairie National Park, Kans.; Sleeping Bear Dunes National Lakeshore, Mich.; and Whiskeytown-Shasta-Trinity National Recreation Area, Calif.

In addition, Congress studied establishment of the Boston National Historic Sites, Mass.; Channel Islands National Seashore, Calif.; Chesapeake and Ohio Canal National Historic Park, Md.; Great Basin National Park, Nev.; Indiana Dunes National Lakeshore, Ind.; Pictured Rocks National Lakeshore, Mich.; Saint-Gaudens National Historic Site, N.H.; Tocks Island National Recreation Area, N.J.-Pa.; and Valle Grande-Bandelier National Park, N. Mex.

## LANDS ACQUIRED FOR PUBLIC USE

Congress appropriated $13,622,000 in fiscal 1963 for purchase of privately owned lands urgently required for recreation, conservation, development, and construction purposes in 24 long-established areas and in 7 newly authorized national park areas to provide public areas for America.

Significant donations of lands and money helped in acquiring land in 15 areas. One donation was for $500,000. This will be used to purchase lands in the Virgin Islands National Park. Exchanges of private lands for Federal lands benefited five areas, and transfers of Federal lands from other Government agencies helped add land to six areas.

Added to the National Park System by various means were 53,919.41 acres of land and water. Through boundary revisions, 4,196.92 acres were excluded, resulting in a net gain of 49,722.49 acres. Most of the excluded acreage reverted to the public domain.

Accessions were as follows: Purchased with appropriated funds, 4,533.98 acres; donated, 24,815.17 acres; transferred, 19,710.00 acres; and exchanged, 4,860.26 acres.

Remaining were 673,400 acres of non-Federal lands and waters within national park areas. Such non-Federal holdings continued as an administrative handicap and prevented complete conservation and full utilization of adjoining Federal lands for public park purposes.

A land-acquisition program started at the new Point Reyes National Seashore, Calif., and land acquisition programs progressed at other recently authorized areas: Fort Smith National Historic Site, Ark.; Lincoln Boyhood National Memorial, Ind.; Mockley Point in Maryland, across the Potomac from Mount Vernon Minute Man National Historical Park, Mass.; and Cape Cod National Seashore, Mass.

Land-purchase programs were underway at five Civil War sites to consolidate Federal holdings in time for centennial celebrations and for permanent preservation of historic scenes.

At year's end 170 contracts were pending for the purchase of lands in 19 areas of the National Park System. When completed, they will bring an additional 5,112.48 acres into Federal ownership. Also pending for title clearance were the gifts of 4,576 acres of land in three areas.

## Boundary Adjustments Made

During the year, Congress authorized additions of lands at Capulin Mountain National Monument, N. Mex.; additions of lands and submerged lands at Virgin Islands National Park in the Virgin Islands; additions of lands and name changes at Big Hole National Battlefield, Mont., and Petersburg National Battlefield, Va., and both additions and deletions of land at Vicksburg National Military Park, Miss.

Congress also directed that the Edison Laboratory National Monument and the Edison Home National Historic Site be combined into the Edison National Historic Site, N.J. Congress also changed Harpers Ferry National Monument, W. Va., to Harpers Ferry National Historic Site.

By Presidential proclamations, 5,361 acres were added to Craters of the Moon National Monument, Idaho; 2,882 acres were added to and 3,925 acres deleted from Bandelier National Monument, N. Mex.; and 5,236 acres of public land were added to and 320 acres were deleted from the Natural Bridges National Monument, Utah.

## Economic Research

Economic research during the year focused on measuring the mpact of proposed parks on the basic economic structure of surrounding areas. An economic study of the proposed Buffalo Na-ional River was made by the University of Arkansas. A similar study was made by Michigan State University of the proposed Pictured Rocks National Lakeshore. Other completed studies were for the proposed Between-the-Lakes National Recreation Area, by he Tennessee State Planning Board, and for Northeastern Vermont, by the University of Vermont. An economic study of a proposed national park on the island of Kauai, Hawaii, is being conducted under contract.

## Special Studies Underway

The National Park Service is cooperating in a significant study of the North Cascades region of the State of Washington being

Glacier Peak in the Wilderness Area of the North Cascades region, in Washington Stat
is a classic example of the serenity of wilderness.

conducted jointly by the Interior and Agriculture Departments A second important study was being conducted by the Service o the Coast Redwoods region of California, made possible by a gran from the National Geographic Society. Another special study o recreation was being conducted in Hawaii under contract. In ac dition, the Service cooperated in a special Wild Rivers Study b the Departments of Agriculture and Interior.

## Long-Range Requirements Studied

The long-range requirements program entered a new phase du ing the year with the assignment of a six-man task force to mak plans for the future course of both the National Park System an the National Park Service. The completed long-range plan, e pected to be released in fiscal 1964, will form the basis for shorte range programs to meet constantly changing conditions imposed b natural growth and need.

The plan will develop long-range objectives and guidelines for the management, use, and development of a well-rounded and evenly distributed National Park System.

Such a long-range plan sees as a foremost challenge the impact of rapidly increasing public use on units of the National Park System. While it took 58 years to reach the one billionth visit, the Service estimates that the second billionth will be reached in 11 years.

# HEAVY PUBLIC DEMAND FOR REPORTS

Public interest in the National Park System was reflected in an unprecedented demand for reports and publications regarding all areas administered by the National Park Service.

## Publications and Services Grow

The National Park Service has a large and varied publication program. Three areas of work are involved: informational folders, student booklets, and books. In fiscal 1963, the National Park Service printed 17,508,000 folders for 175 areas and 70,000 copies of 4 general informational folders. Four student booklets were added to a library of over 40 such works. Four reference or research documents were under preparation.

The public inquiries function of the National Park Service is closely alined with the Service's publishing program. Each year the number of inquiries for general information increases. In iscal 1963, almost 65,000 inquiries were received by letter, telephone, or personal visit. More than 90 percent of these requests were answered in some way with printed material.

## Audiovisual Services Improved

More emphasis was placed on the quality of audiovisual program materials. Two recording technicians were added to the staff of he Branch of Audiovisual Services to improve the fidelity of Service-recorded material. New audiovisual program materials created during the year included production of 11 sound-slide film rograms for visitor centers and a 16-mm. motion picture film for ort McHenry's new Visitor Center, completion of 8 new cabinet nstallations using captioned slides, and production of 39 recorded essages for new audio stations. As a result of the audiovisual nstallations during the past several years, the work of providing eplacement tapes increased tremendously.

Efforts to increase interpretive service to visitors from othe countries continued. Audio messages in six languages were prepared through the cooperation of the Voice of America for use a Congress Hall (Independence National Historical Park) in Philadelphia, Pa.

The Branch of Still and Motion Pictures was reorganized. new system was set up for filing and distributing still pictures, motion pictures, slides and transparencies. This makes such materials more accessible to its users and saves money.

Plans were made to obtain more photographs from field unit and regional offices to insure a steady flow of quality material t meet the steadily increasing number of requests.

At year's end, a contract was awarded for production of a National Park Service film for public distribution.

## International Cooperation Increased

The Division of International Cooperation held conferences o park projects with representatives from England, Norway, Denmark, Germany, Italy, Switzerland, Katanga, Ghana, East an South Africa, India, Thailand, Malaya, the Philippines, New Zealand, and Australia.

An outstanding event was the First World Conference on National Parks held in Seattle June 30 to July 7, 1962. Field trips i connection with the conference were made to Mount Rainier, Olympic, Yellowstone, Yosemite, and Glacier National Parks. Near 300 delegates from 63 countries participated in the conference.

During the past year more than 2,000 letters of inquiry fro abroad were received and were answered by the Division of Inte national Cooperation. The Service estimated that 2,500,000 fo eign visitors from 92 countries were received by personal conta by staff members of the National Park Service outside the N tional Capital Parks area.

Technical assistance projects were undertaken in Rhodesia, Ta ganyika, Kenya, England, and South Africa. Specialized, inser ice, and on-the-job training was extended to 31 persons fro Kenya, Uganda, the Congo, South Africa, Nyasaland, Venezue Argentina, Philippines, Thailand, Israel, Pakistan, Lebanon, a Costa Rica. Special programs were arranged for groups of teac ers and educators from 15 different countries. Special schedul in National Park Service areas were arranged for photograph radio, and communications teams from Indonesia, Kenya, Jap Austria, and France.

Jefferson Memorial, and other National Capital Region areas, attracted nearly 7,000,000 visitors during fiscal year 1963. A new feature was the floodlighting of several of the memorials at night.

## NATIONAL CAPITAL REGION CREATED

Region Six became the "National Capital Region" when the regional offices of the National Park Service were given geographical designations instead of numbers. Construction of a new "home" for the National Capital Region offices in East Potomac Park was virtually completed during the fiscal year, providing a central site to unify activities of the region. Construction of the Park Police Headquarters wing to the Operations Building started and was expected to be completed before the end of fiscal 1964.

## Memorials

Visits reached a record high of nearly 7,100,000, an increase of 12.7 percent over 1962. Visiting hours at the Jefferson Memorial were extended and floodlighting of the memorial at night created much favorable comment.

## Recreational Opportunities Increased

Due to increased public use of recreational facilities in the park system, the maintenance force conditioned and placed into use a record number of athletic fields. Several additional recreational programs, such as track meets, were scheduled. Considerable work was undertaken to condition the grounds of the new District of Columbia Stadium and develop practice football fields.

Fifty picnic sites at Fort Washington and 60 sites at Fort Hunt were completed and opened. Development of 200 additional picnic areas at Turkey Run Recreational Area, 50 at Greenbelt Park, and 220 at Carderock Recreational Center started. Sixty new picnic sites neared completion at Prince William Forest Park; others were improved.

Additional park facilities were provided and the channel dredged for a boat-launching ramp at Daingerfield Island Marina. A boat-launching site was opened at Gravelly Point on the George Washington Memorial Parkway.

The Potomac Park Motor Court was closed December 31, 1962, because of sewer construction and other factors, thus making the need for increased camping facilities in the National Capital Region more evident than ever. At Prince William Forest Park, construction of 120 new fully equipped family tent campsites was virtually completed. Plans were laid for constructing a trailer village in the park. This facility should be ready for use by the beginning of the 1964 camping season. Work started on 50 new tent campsites at Greenbelt Park. Early completion was planned. Additional sites will be developed if requirements increase.

## Park Police Enlarged

The authorization of 31 new positions on the U.S. Park Police Force and retirement of several experienced men necessitated an accelerated recruitment and training program. Specialized training received by supervisors and trainees contributed greatly to a higher level of performance and effectiveness of the protective forces.

### Proposed Memorials

Designs and locations of the Taras Shevchenko Memorial and the Mary McLeod Bethune Memorial, authorized by Congress for location in the park system, were approved. The Boy Scout Memorial on the grounds south of the White House neared completion. A contract was let for constructing the Theodore Roosevelt Memorial on Roosevelt Island.

## ADMINISTRATION

The following is a comparison of the 1963 appropriations with those for 1962:

| Appropriation item | 1962 fiscal year | 1963 fiscal year | Increase |
|---|---|---|---|
| Service appropriations: | | | |
| Management and protection | $22, 548, 851 | $25, 383, 304 | $2, 834, 453 |
| Maintenance and rehabilitation of physical facilities | 18, 094, 000 | 20, 578, 550 | 2, 484, 550 |
| General administrative expenses | 1, 581, 000 | 2, 055, 200 | 474, 200 |
| Construction | 37, 976, 000 | 45, 775, 500 | 7, 799, 500 |
| Construction (liquidation of contract authorization) | 30, 000, 000 | 27, 000, 000 | —3, 000, 000 |
| Total cash appropriations | 110, 199, 851 | 120, 792, 554 | 10, 592, 703 |
| Construction (amount by which roads and trails and parkways contract authorization exceeded cash appropriation) | 4, 000, 000 | 7, 000, 000 | 3, 000, 000 |
| Total new obligational authority Service appropriations | 114, 199, 851 | 127, 792, 554 | 13, 592, 703 |
| Appropriation transfers from other agencies | 8, 346, 416 | 16, 220, 644 | 7, 874, 228 |
| Grand total, new obligational authority | 122, 546, 267 | 144, 013, 198 | 21, 466, 931 |

Of the total increase for fiscal 1963, $996,000 was for increased salary costs as authorized by the Congress; $1,615,000 was for a share of the cost of constructing airports in the vicinity of Grand Canyon and Yellowstone National Parks; $5 million for starting land acquisition for Point Reyes National Seashore, Calif.; and $7,976,000 for various projects under the Accelerated Public Works program. The remainder, $5,879,931, was for strengthening the various Service programs, including Mission 66 developments.

### Financial Management Improved

A study was made during the year of the accounting and payroll operations at Mount Rainier and Olympic National Parks, Wash. to determine whether such functions should be transferred to the

Western Regional Office in San Francisco, Calif. On the basis of the study findings, the Service is planning to abolish these two field finance offices during fiscal 1964. This will reduce the number of field finance offices to 20 with an annual savings of approximately $18,000. At the start of the financial management improvement program in 1954, there were 46 field finance offices.

A new financial management system to serve the three field Design and Construction Offices was developed during the year and installed on a pilot basis in the Western Office in San Francisco, Calif. The major feature of the system is a new chart of cost accounts designed to meet specific needs. Other features include elimination of certain duplications of effort that had evolved over a period of time, the streamlining of fiscal document review, and more meaningful financial reporting to management. The system will be installed in the Eastern Office of Design and Construction, Philadelphia, and the National Capital Office of Design and Construction, Washington, D.C., during fiscal 1964.

During the year a task force study was made of the Service's cost accounting classifications, other than those for the Design and Construction Field Office operations, in the light of management needs for cost data. As a result, the chart of cost accounts was modified, effective at the beginning of fiscal 1964, eliminating and combining many of the classifications with a net reduction of about 47 percent in the number of cost accounts comprising the chart. This modification will bring about better use of manpower and will provide more meaningful cost data to management.

## Management Appraisal Program Approved

A management appraisal program was approved and should help assure top management of the effective and proper use of delegated authority, manpower and funds, and the efficiency and coordination of all activities. A major periodic management review is to be conducted in each regional office at least once every 2 years and of every park in the region at least once every 3 years. Thus, over a 3-year period each park will have been appraised. The management appraisal program is a vital tool in the management of the Service and should produce significant economies in manpower and fund utilization.

## Personnel and Employment Programs Advanced

Fiscal 1963 was of considerable significance in the training field. The Branch of Employee Development and Training, in the Division of Personnel, conducted 1-week supervisory training courses for a total of 150 first-line supervisors in 4 of our 6 regions. These courses were unique in that this was a new training area for the Washington Office (previous management training has been conducted at upper management levels) ; and one-half the participants in each course were "blue-collar" supervisors. The coaching phase of the Service's Management Development Program started. A booklet, "A Plan for the Man," was distributed to all managerial employees. The goal to be attained with the use of guidance presented in the booklet is the preparation of an individualized development plan, mutually agreed upon by the supervisor and his subordinate, for each service employee in a leadership position.

Increased attention was devoted to the equal employment opportunity program and to the employment of women in types of positions for which they are particularly suited, such as park guide and park interpretive positions.

## Safety Improvements Noted

Substantial improvements in most of the 20 categories of the accident record continued. The significance of this contribution to good management and efficiency is that this accomplishment was made during a period of recordbreaking visitor use and a tremendous increase in variety of activities in the Service programs.

# Bureau of Outdoor Recreation

### Edward C. Crafts, Director

## The First Year

Fiscal year 1963 was the first complete year of operations for the Bureau of Outdoor Recreation. The Bureau was established April 2, 1962, by Secretray Udall at the direction of President Kennedy and upon recommendation of the Outdoor Recreation Resources Review Commission.

The Bureau functions as a focal point of responsibility in outdoor recreation within the Federal Government. It manages no land. Its major responsibilities involve long-range nationwide planning, promotion of Federal coordination, and stimulation and assistance to the States, their political subdivisions, and the private sector in outdoor recreation.

Faced with the problems of organization and staffing, plus the demands of a full workload, the pace established by the Bureau in its first year of operations has been strenuous. The number of employees reached 135 toward the end of the fiscal year, too few to accomplish all assignments, yet enough to achieve considerable progress on several sorely needed projects.

Among other accomplishments, the Bureau performed several specific assignments for the Recreation Advisory Council; investigated and made recommendations concerning several potential recreation areas; started limited operations in six regional offices; and cooperated on numerous occasions with Federal, State, local, and private agencies in the interest of fostering and promoting outdoor recreation opportunities.

## Organic Act Approved by Congress

On May 28, 1963, legislation defining basic responsibilities of the Federal Government in outdoor recreation was signed by President

Kennedy. The legislation, Public Law 88–29, is regarded as the Bureau of Outdoor Recreation's organic act.

The bill that received final congressional approval had been submitted to the Congress in January 1963 and provides the Bureau with ample authority in the outdoor recreation field.

## RECREATION ADVISORY COUNCIL

The President's Recreation Advisory Council, established by Executive Order on April 27, 1962, and made responsible for providing broad policy advice to the heads of Federal agencies on important matters affecting outdoor recreation, facilitates coordination of outdoor recreation efforts of the various Federal agencies.

The Executive Order establishing the Recreation Advisory Council made the Secretary of the Interior responsible, in consultation with other members, for developing methods and procedures for improved interagency coordination in carrying out national recreation policies.

During fiscal 1963, the Secretary of Commerce was added to the Council's membership. Other members are: The Secretary of the Interior, the Secretary of Agriculture, the Secretary of Defense, the Secretary of Health, Education, and Welfare, and the Administrator of the Housing and Home Finance Agency.

The Council met twice during the year. It adopted Policy Circular No. 1, which established criteria for national recreation areas. It concurred in plans involving the proposed Whiskeytown-Shasta-Trinity National Recreation Area in California, the Oregon Dunes National Seashore in Oregon, and the Flaming Gorge National Recreation Area in Utah and Wyoming.

The Council also authorized staff studies of a national system of parkways and scenic roads, a national recreation policy, a national public health and water pollution policy with special relation to outdoor recreation, and a national policy on recreation costs and benefits at Federal multiple-purpose reservoir projects.

### Policy Circular No. 1—Recreation Advisory Council

A major accomplishment of the Council during the year was the issuance of Policy Circular No. 1 on a relatively new category of Federal lands—national recreation areas. It sets forth criteria for selecting, establishing, and administering such areas throughout the Nation.

The magnificent Oregon Dunes, consisting of 35,000 acres along the central Oregon coast, have been proposed for National Seashore status as part of the Department's program of preserving our vanishing shoreline.

The new national recreation area category is designed to help meet the Nation's mounting needs for outdoor recreation The areas will include lands possessing above-average natural endowments, but of less significance than the unique scenic and historic elements of the National Park System.

Establishment of a national recreation area will require an act of Congress. Criteria set forth by the Council for this new-type Federal recreation facility include:

1. *Spaciousness.*—National recreation areas should include not less than 20,000 acres of land and water surface, except along riverways, narrow coastal strips, or areas where population density within a 250-mile radius is in excess of 30 million people.

2. *High carrying capacity.*—Such areas should be located and designed to serve large numbers of people in relation to the type of recreation offered.

3. *Interstate use.*—Such areas should provide recreation opportunities significant enough to assure interstate patronage within the region of service, and should attract patronage from outside the normal service region.

In addition, the scale of investment and development should require Federal participation; the areas should not be located more than 250 miles from urban centers; the use of natural resources should be compatible with the recreation mission; and such areas should be established only in regions where other programs will not fulfill high-priority recreation needs in the foreseeable future.

## Parkways and Scenic Roads

A study to determine the feasibility of a national system of scenic roads and parkways was ordered by the Recreation Advisory Council during the year.

A task force, composed of representatives of the Bureau of Public Roads, National Park Service, Forest Service, the Housing and Home Finance Agency, and the Bureau of Outdoor Recreation was appointed to conduct the study. The group was expected to submit its recommendations later in 1963.

Proponents point out that establishment of a network of scenic routes and parkways could serve millions of persons each year, relieving travelers of the necessity of going great distances on highways and superhighways to enjoy a few miles of scenic driving.

The findings of the Outdoor Recreation Resources Review Commission as to the widespread popularity of pleasure driving, and the experience of the heavily used Blue Ridge Parkway and other scenic ways, underscore the necessity of developing new concepts and facilities to provide for this type recreation.

## New National Recreation Area Planned

In June 1963, the Tennessee Valley Authority announced plans to develop a demonstration national recreation area in Kentucky and Tennessee. The Recreation Advisory Council had participated in an agreement leading to the project.

President Kennedy announced that the Between-the-Lakes National Recreation Area will be undertaken as a demonstration in resource development. It lies in the 170,000-acre Between-the-Lakes region between TVA's Kentucky Reservoir on the Tennessee River and the Army Corps of Engineers' Barkley Reservoir across the divide on the Cumberland River.

The shorelines of the two lakes are only 6 to 12 miles apart for some 40 miles above each dam. They enclose a narrow strip of wooded ridges rising up to 300 feet above the reservoirs on either side.

Development of the project will demonstrate how an area with limited timber, agricultural, and industrial resources can be converted into a national recreation asset and thereby stimulate economic growth of the region. It also will help establish and define guidelines for the acquisition, development, and operation of other outdoor recreation areas.

The area will include provision for developing new waterfowl wintering grounds in cooperation with the Bureau of Sport Fish-

The population explosion and the tensions of modern life require the preservation of open spaces where our citizens can maintain a contact with nature.

eries and Wildlife and for managing upland game, including improvement of public hunting.

President Kennedy noted that the Between-the-Lakes area is within 200 miles of nearly 10 million people living in the Midwest and that the development of a national recreation area in that location thus meets the Outdoor Recreation Resources Review Commission recommendation that recreation facilities for more densely populated areas merit high priority.

TVA planned to start the project immediately. It will administer the area for an estimated 10 years, the period required to complete the demonstration. At the end of that time, arrangements for permanent administration of the area for outdoor recreation will be determined, looking toward a Federal-State partnership.

## Assateague Island Suggested for National Seashore

Assateague Island, one of the last remaining undeveloped stretches of shoreline on the Middle Atlantic, was recommended for national seashore status by the Bureau of Outdoor Recreation in an April 1963 report. Legislation authorizing the project has been introduced in both Houses of Congress.

The report emphasized the need for early action before Assateague is preempted for other uses. More than 33 million people live within 250 miles of the island. The Bureau estimated that more than 3 million persons would visit the island annually in the initial period following its establishment.

The report recommends that the island, a sandy barrier reef, be managed for public recreation use. A balance between high-density and low-density recreation use would be encouraged. The north portion of the island would be under the jurisdiction of the State of Maryland and would be developed as a State park. Chincoteague National Wildlife Refuge, in the southern portion of the island, would also retain its identity, but would be managed to provide recreation opportunities consistent with its primary objective.

Assateague, stretching some 33 miles along the Maryland and Virginia coastline, is the largest undeveloped seashore between Cape Hatteras, N.C., and Cape Cod, Mass.

The mainland opposite Assateague Island is 130 miles from Baltimore, 140 miles from Washington, and is readily accessible to motorists via the Bay Bridge and U.S. Route 50.

A clean sand beach, the island's outstanding feature, is wide and gently sloping. With a minimum of development it could provide unexcelled opportunities for swimming, surfing, sunbathing, and other popular beach activities.

The island offers extensive opportunities for fishing, swimming, and boating. Marshes on the bay side provide superb habitat for a large variety of shorebirds and waterfowl, as well as for numerous other birds and wildlife.

Assateague's natural values, coupled with its proximity to large centers of population and accessibility to large interstate areas, make it appropriate for national seashore status.

## AGRICULTURE-INTERIOR AGREEMENT ON RECREATION

In January 1963, Secretary of Agriculture Orville L. Freeman and Secretary Udall announced a significant agreement between the two departments to help implement the administration's outdoor recreation program.

In a letter to President Kennedy, the two Secretaries reported they had developed a new conservation policy. This will further development of Federal recreation resources, eliminate costly competition, promote cooperation, and recognize the major roles that both departments have in administering Federal lands under their jurisdiction for recreation purposes. Many recreation benefits may result from their joint action.

Secretary Freeman and Secretary Udall agreed on a broad range of issues to enable their departments to enter into "a new era of cooperation" in managing Federal lands for outdoor recreation.

"This agreement settles issues which have long been involved in public controversy," they said. "We have closed the book on these disputes and are now ready to implement harmoniously the agreed-upon solutions."

President Kennedy hailed the new policy as "an excellent statement of cooperation representing a milestone in conservation programs."

The two Secretaries announced that the following principles would govern their new policy of cooperation:

1. Mutual recognition for the distinctive administrative functions of the Forest Service and the National Park Service.
2. No disturbance of jurisdictional responsibility among the agencies of the two departments managing and developing lands for public recreation except for existing administration

proposals, proposals covered by the agreement, or routine boundary adjustments.

3. No unilateral new proposals to change the status of lands under the jurisdiction of the other department. Joint studies will be the rule.

4. Each department, with the support and cooperation of the other, will endeavor to develop fully and manage effectively recreation lands now under its administration.

In line with the agreement, the two Secretaries announced they would recommend two new national recreation areas—the Whiskeytown-Shasta-Trinity Area in northern California and the Flaming Gorge Area in Wyoming and Utah—as well as a new national seashore—the Oregon Dunes—along the Oregon coast.

They also said a joint study would be made of Federal lands in the North Cascade Mountains of Washington to determine the management and administration of those lands which would best serve the public interest.

## Proposed National Recreation Areas and National Seashore

The two new national recreation areas and the new national seashore in Oregon which Secretary of Agriculture Freeman and Secretary of the Interior Udall have agreed to recommend to Congress would provide recreation seekers with opportunities for a broad and challenging range of outdoor experiences. Establishment of all three areas depends on congressional action.

### Whiskeytown-Shasta-Trinity

The proposed Whiskeytown-Shasta-Trinity National Recreation Area of about 200,000 acres in northern California would consist of three noncontiguous units surrounding reservoirs constructed by the Bureau of Reclamation. Portions of the proposed national recreation area border Shasta Lake and the Trinity-Lewiston Reservoirs within the boundaries of Shasta and Trinity National Forests. These portions would be administered by the Forest Service.

The new recreation area also would include about 40,000 acres around the Whiskeytown Reservoir. This land is outside the national forest and would be administered by the National Park Service.

### Flaming Gorge

The proposed Flaming Gorge National Recreation Area of about 160,000 acres is on the Green River in northeastern Utah and adjacent areas at Wyoming. It is upstream from the Bureau of

Reclamation dam under construction at Flaming Gorge. The Department of the Interior and the Department of Agriculture agreed that the 40,000 acres lying within the national forest boundary would be administered by the Forest Service, with the National Park Service managing the other 120,000 acres.

### Oregon Dunes

The proposed Oregon Dunes National Seashore, consisting of about 35,000 acres of sand dunes along the central Oregon coast, has for the most part been under the protection and management of the Forest Service. Under the Secretaries' agreement, administration of this area would be the responsibility of the National Park Service.

## SPECIAL STUDIES

The Bureau of Outdoor Recreation started several special studies during the year. These were assigned by Secretary Udall, by the Recreation Advisory Council, and, in some instances, by the Secretaries of the Interior and Agriculture acting jointly.

### Wild Rivers Study

Appointment of a five-man group to study the need for preserving a nationwide system of wild rivers particularly suited to outdoor recreation was announced in May 1963 by the Secretary of the Interior and the Secretary of Agriculture.

The two Secretaries selected Director Crafts of the Bureau of Outdoor Recreation to head the study. Department of Agriculture members were Byron B. Beattie, Director of the Division of Watershed Management, Forest Service, and Dr. Laurence I. Hewes, Jr., assistant to the Director, Office of Rural Areas Development. Department of the Interior members were Ben H. Thompson, Assistant Director of the National Park Service, and A. Heaton Underhill, Assistant Director of the Bureau of Outdoor Recreation. Dr. Hewes was later replaced by John H. Sieker, Director, Division of Recreation and Land Uses, Forest Service.

Secretary Udall and Secretary Freeman requested the study team to identify those portions of wild streams and rivers which have the highest outdoor recreation potential. The team's report and recommendations were to be submitted to the two Secretaries and later to the Recreation Advisory Council.

"The fish, wildlife, and outdoor recreation functions inherent in our natural rivers certainly rank among the finest of our outdoor

The Allagash River flows for nearly 100 miles through the heart of Maine's backwoods. This classic wilderness canoe route—the last of the eastern and lake wilderness—has been proposed as a National Riverway.

resources," the Secretaries said in a joint statement. "Many such rivers already flow through national parks and national forests and consequently are accorded some degree of protection."

## North Cascades Mountain Study

The resource potential of Federal lands in the magnificent North Cascade Mountains in Washington and the form of management best suited to the public interest are being studied by a group appointed jointly by Secretary Freeman and Secretary Udall.

Appointed in March 1963, the study team was headed by Director Crafts. Serving with him were Dr. George A. Selke, consultant to Secretary Freeman; Arthur Greeley, Deputy Chief of the Forest Service; Henry Caulfield, Jr., Assistant Director of the Department of the Interior's Resources Program Staff; and George B. Hartzog, Jr., Associate Director of the National Park Service. Mr. Caulfield was later replaced by Dr. Owen S. Stratton, Consultant to the Department of the Interior.

A series of resource substudies was started to provide a factual basis for recommendations. These included: Regional Economy, Water and Power, Recreation, Timber, Minerals and Geology, Fish and Wildlife, and Forage.

The study team scheduled a field investigation of the North Cascades in the summer of 1963 and announced that field hearings would be held in the fall of 1963.

The North Cascades area in Washington State long has been the subject of conflicting proposals for development by outdoor, commercial forestry, and other interested groups. The area involved lies within national forests and contains some of the most rugged and majestic scenery in the Nation. Much of it is high country, with the mountain peaks towering well above the timberline. Portions of the area designated as wilderness and primitive by the Forest Service exclude logging and most other commercial operations.

Plans call for the study team to submit recommendations to the two Secretaries who, in turn, will make recommendations to the President. No time limit was set for the group to submit its report, but the two Secretaries urged it to "proceed with due deliberation and haste."

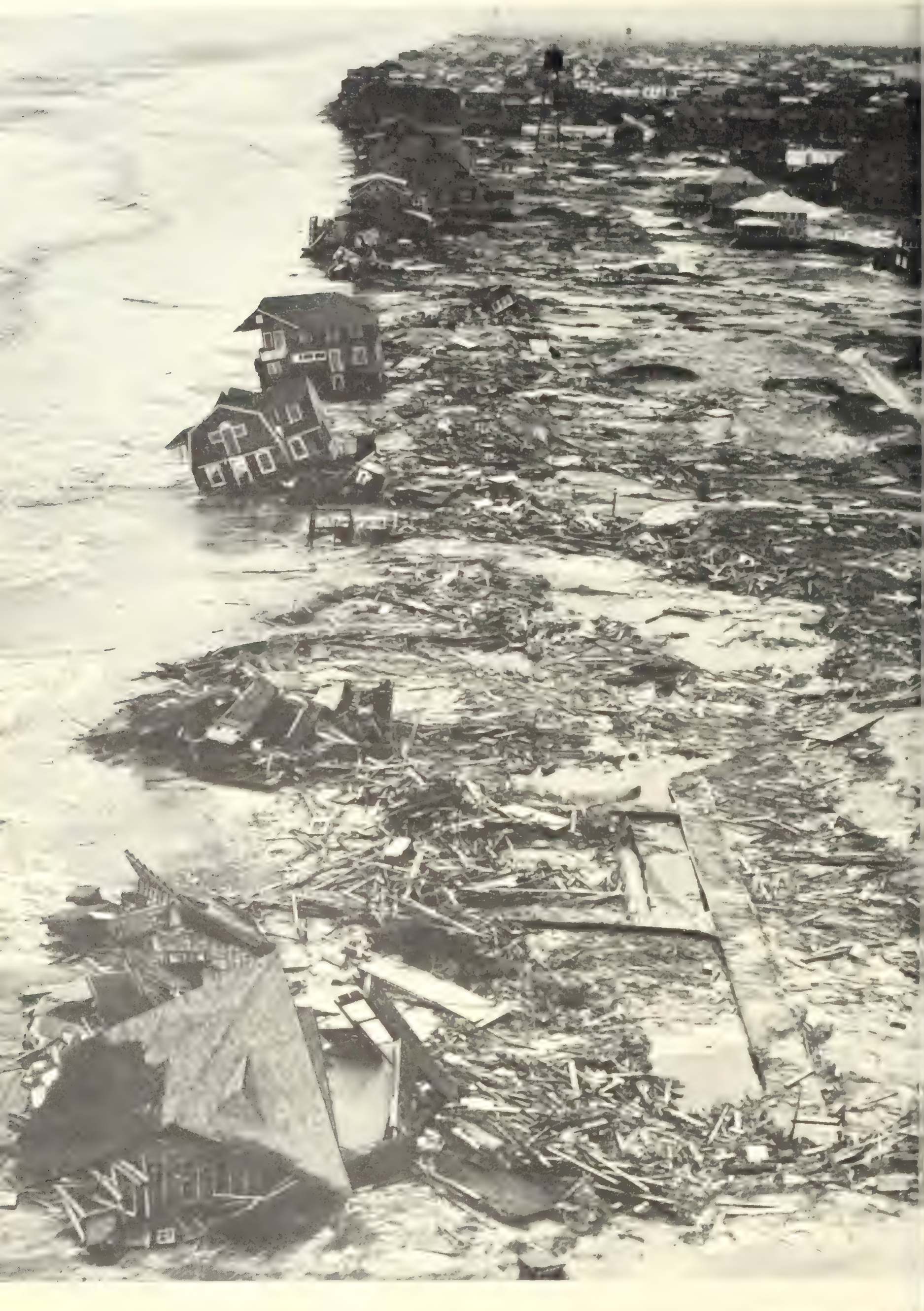
Because of the history and the complex issues involved, the study team does not expect to complete its report before December 1964.

## Fire Island Study

Establishment of a new Fire Island National Seashore to help serve the recreation needs of the New York metropolitan complex was recommended by Secretary Udall in a statement urging congressional approval of authorizing Federal legislation. As recommended by Secretary Udall, the new national seashore would extend from Fire Island Inlet to the junction of Meadow Lane and Halsey Neck Lane in the village of Southampton.

Fire Island National Seashore would encompass about 8,000 acres of land and include 52 miles of relatively undeveloped barrier reef seashore. Land acquisition costs have been estimated as not exceeding $20 million.

The west end of the proposed area is within 50 miles of the center of New York City. More than 16 million people in several States live within a 100-mile radius. Fire Island proper is a narrow 32-mile-long sand reef varying from several hundred yards to one-half mile in width. Fire Island State Park now occupies the western 4 miles of the island, but it is undeveloped. Two other



Intensive development and dune erosion leads to extensive loss of property and lif when high tides and storms hit the Atlantic coast, such as on Long Island shown above underscoring the necessity of stabilizing existing undeveloped areas—Fire Island an Assateague Island—as National Seashores in public ownership.—Courtesy, Newsday.

stretches of barrier reef, one attached to Long Island, would comprise the remainder of the 52-mile-long proposed area.

"Nowhere else in the country is there a greater need by so many people for additional outdoor recreation opportunities that can be supplied in abundance and variety," Secretary Udall stated. "Unless early action is taken to protect this area for public use, it will inevitably be developed for more limited use and the opportunity lost forever."

## Allagash River Study

A study of outdoor recreation potentials of the famous Allagash River in northern Maine was begun by the Bureau of Outdoor Recreation in 1963 upon assignment from Secretary Udall.

The Bureau was to report whether unusual natural recreation opportunities associated with the Allagash would warrant taking necessary action to maintain the opportunities for backcountry canoe travel characteristic of the early days of America.

The Bureau's report was to consider—

1. The Allagash River as a unique recreation resource, assessing which portions of the waterways and adjoining lands would be suitable for inclusion in a national recreation area.
2. Which agency, or combination of agencies, would be best suited to administer the area.
3. The need for legislation to designate the Allagash as a national riverway.

The Allagash is one of the few remaining free-flowing streams in the eastern United States and is a major recreation resource of great potential significance to the Nation.

The report will be prepared by the Bureau of Outdoor Recreation in consultation with the National Park Service, State agencies, and private interests.

## Pictured Rocks Study

Also at the direction of Secretary Udall, the Bureau began studying a proposal for a new approach to possible establishment of a Pictured Rocks National Lakeshore in Michigan.

Director Crafts of the Bureau of Outdoor Recreation was instructed to consult with the National Park Service, other Department of the Interior agencies, the Forest Service, and State and local officials and private individuals in connection with the assignment.

The proposal would provide for commercial as well as recreation use of resources in the Pictured Rocks Area and would protect tenure of landowners in the proposed area. It also would permit commercial forestry on private lands if carried out under management guidance of the Forest Service.

# GENERAL POLICY, PLANNING, AND COORDINATION

## Federal Coordination

During the year, the Bureau of Outdoor Recreation, in carrying out its responsibilities for Federal coordination, established contacts with Washington and field offices of most of the Federal agencies concerned with outdoor recreation.

Particular consideration was given to establishing a working relationship with those agencies and interagency groups responsible for the planning and development of water and related land resources. The aim was to develop and put into effect procedures leading to cooperation with these agencies.

Tentative agreement was reached with the Public Health Service, Soil Conservation Service, Federal Power Commission, and with the Corps of Engineers regarding the type and scope of services the Bureau of Outdoor Recreation would provide those agencies in

Lake Michigan's eroded Grand Portal is an arch in the proposed Pictured Rocks National Lakeshore. This is one of the few remaining wild areas on the Great Lakes.

developing comprehensive river basin plans and in the technical review of specific project proposals.

An agreement dividing responsibility for recreation planning at Bureau of Reclamation projects was reached between the Bureau of Outdoor Recreation and the National Park Service.

An agreement was also developed with the Bureau of Land Management to review applications for lands for recreation purposes under the Recreation and Public Purposes Act.

Main activities of the Bureau of Outdoor Recreation in connection with its support of the Recreation Advisory Council involved several policy studies on user charges, national recreation policy, disposal of surplus military lands, public health policy for outdoor recreation, scenic roads and parkways, and recreation benefit and cost allocation formulas.

Policy Circular No. 1, "Federal Executive Branch Policy Governing the Selection, Establishment, and Administration of National Recreation Areas," was completed and distributed to interested persons.

The Bureau also began working on a way to evaluate the total annual Federal investment in outdoor recreation. This step was preliminary to providing Federal budget guidance and review of long-range plans.

## Outdoor Recreation Research

The Bureau instituted its Division of Research in fiscal year 1963 by cosponsoring the first National Conference on Outdoor Recreation Research at the University of Michigan, Ann Arbor, May 6–8, 1963. It was attended by 170 local, State, and national educators, research personnel, and outdoor recreation officials.

First of its kind in the Nation's history, the conference contributed significantly to broader understanding of recreation research by public, private, and university research agencies. This ultimately will help solve critical outdoor recreation problems confronting the Nation.

Both Secretary Udall and Secretary Freeman addressed the Ann Arbor session.

In connection with its research responsibilities, the Bureau of Outdoor Recreation began a comprehensive review of outdoor recreation literature and evaluated the problem of developing a data-retrieval system. The objective is to develop a clearinghouse and abstracting service for persons working in outdoor recreation research.

A "Directory of Federal and State Agencies Concerned With Outdoor Recreation" was compiled and distributed during the year by the Bureau. At the request of the National Conference on State Parks, the Bureau continued collecting statistics on State parks and enlarged the scope of the survey to include other State outdoor recreation areas. A compilation, "State Outdoor Recreation Statistics, 1962," was scheduled for publication in the fall of 1963.

## Cooperative Services

The Bureau of Outdoor Recreation also broadened its State cooperative, consulting, and advisory services to cover all State agencies and their local counterparts concerned with outdoor recreation. Such services had been oriented largely to State park agencies before the function was transferred to the Bureau of Outdoor Recreation from the National Park Service in April 1962.

In addition, the Bureau furnished cooperative services to agencies and organizations on a variety of subjects. Representative of this assistance were: a report on the recreation development potential of a water catchment area at the city of Palm Beach, Fla.; a proposal for Elmer Park Development submitted to the Director of the Museum of the Great Plains, Lawton, Okla.; a study on a proposed Lake Phelps Recreation Area, North Carolina Division of State Parks; and a report on "Interpretation in the Michigan State Parks."

Among other projects involving State cooperative services, the Bureau of Outdoor Recreation reviewed applications, made inspections, and furnished recommendations to the General Services Administration on 19 surplus Federal properties requested by the States or their political subdivisions for park, recreation, or historic monument purposes. These properties involved 2,086 acres valued at $4.2 million. Compliance reviews were made on 254 transferred Federal surplus properties. Eighty-one applications by State and local agencies to acquire public domain lands for public park and recreation purposes were reviewed, with recommendations furnished to the Bureau of Land Management.

The Bureau also investigated and prepared reports concerning the recreation potential of various military lands in widely scattered sections of the country and attended and participated in numerous national, regional, and State recreation meetings.

## Planning and Surveys

In discharging its responsibilities for nationwide planning and surveys, the Bureau conducted field studies regarding recreation at Allegheny Reservoir in Pennsylvania and New York; Fire Island, N.Y.; Clinchfield Coal Co. Lands and Coal River Area, West Virginia; Assateague Island in Maryland and Virginia; Buffalo River, Ark.; Oregon Dunes, Oreg.; Islandia, Fla., and the Deschutes River, Oreg.

The Bureau also participated in other planning and survey studies. Among these were a joint Army-Interior study of the Upper Missouri River between Fort Peck Reservoir and Fort Benton, Mont.; comprehensive surveys of the Susquehanna River Basin and the Ohio River Basin in cooperation with the Corps of Engineers; and a comprehensive survey of the Illinois River-Great Lakes Basin in cooperation with the Department of Health, Education, and Welfare.

Impressive rock formations, such as the Druid Arch, typify the landscape at the proposed Canyonland National Park in southeastern Utah.

The Bureau was responsible for issuing reports related to the tourist and recreation potential of eastern Kentucky, northern Alabama, and Middle Island Creek, W. Va., as well as for preparation of "Guidelines to Statewide Recreation Planning" for use by States in connection with Area Redevelopment Administration projects.

Guidelines for statewide recreation planning and procedures for nationwide planning were being drafted at year's end.

# Office of Territories

## Richard F. Taitano, Director

The development of non-self-governing areas is receiving world-wide attention and the administration of the territories of the United States becomes increasingly important. During fiscal 1963, significant achievements were made in all areas of activity in Guam, American Samoa, the Virgin Islands, and in the Trust Territory of the Pacific Islands (administered by the United States under an agreement with the Security Council of the United Nations).

An important step was taken by the Legislature of the Virgin Islands during the year in passing a new Election Code establishing primary elections for the first time in the history of the islands and facilitating the establishment of a two-party system of government. The Virgin Islands also made a major achievement in higher education with the opening of the College of the Virgin Islands. Of prime importance to the community, this college will serve the needs of the citizens of the territory as well as the entire Caribbean area.

In American Samoa, significant strides were made when the legislature passed a tax-reform measure. This adopted as a Samoan tax the U.S. Federal income tax schedules, plus a 2-percent tax on wage earners who, because of low income or dependency, would not be taxable under the U.S. schedules. In passing the measure the Samoan Legislature indicated its desire to have the Samoan people assume proportionately as much of the budget of running the government of American Samoa as is contributed by U.S. taxpayers to the Federal Treasury. Another forward move in the development of the territory was the inauguration in December 1962 of weekly jet airline service from Honolulu to Sydney via Pago Pago by Pan American Airlines, making American Samoa much more attractive to industry and to tourists. Construction of new terminal facilities was underway at year's end.

In the Trust Territory of the Pacific Islands, the administration was unified July 1, 1962, with the transfer of the Saipan District from the Navy Department to the Department of the Interior. The provisional capital of the Trust Territory was established on the island of Saipan. Marked progress developing a competent self-government was evidenced by steps being taken to transform the Council of Micronesia into a legislative body.

An important action aimed at boosting the development of Guam's economy was the lifting by the President on August 21, 1962, of the security requirements formerly in effect regarding the entry of U.S. and foreign nationals into Guam. Another forward step was the expansion of the College of Guam from a 2-year junior college to a 4-year institution.

## AMERICAN SAMOA HOST TO CONFERENCE

During July 1962, the government of American Samoa was host to the Fifth South Pacific Conference. Secretary Udall and a large group of officials from Washington, D.C., and Hawaii arrived for the conference in the first commercial jet to land on Samoa's new Pago Pago International Airport. Secretary Udall dedicated the airport, with delegates from all over the South Pacific participating. The group then proceeded to the new Polynesian-style civic auditorium that had been rushed to completion in time for the conference. After a brief dedicatory ceremony, the Fifth South Pacific Conference was opened with a message from President Kennedy and the address of welcome by Secretary Udall. The highly successful conference covered 2 weeks. Various delegates were impressed by the recent developments.

After the conference, various departments of Government were returned to planning and starting further development projects in the fields of education, health, roads, electrification, and sanitation, and other areas. Various consulting and engineering firms were brought to Samoa to assist in the planning and engineering.

n traditional ceremony, a Samoan chief watches the setting of the first post for a new et terminal building at Tafuna Airport in American Samoa. The building will be an authentic Samoan thatch-roof fale, part of a three-building terminal complex at the new et field.

## Education Grows

In September 1962, the High School of American Samoa opened with adequate stateside certified teachers and classrooms for all students who had been graduated from junior high school. This was the first time in Samoa's history that more than one-third the qualified students had been accepted.

At the same time, 6-year-olds were taken into the school system for the first time. This greatly increased the number of students in public schools in American Samoa.

Samoans employed by accelerated public works poured the first concrete in May 1963 in constructing for the educational television consolidated elementary school program at Nua Village on American Samoa's main island of Tutuila.

Engineering studies were completed for 20 new consolidated schools which, when completed, will supply new schools for all the elementary school system. By the end of the fiscal year, the first consolidated school was well underway, materials were enroute for the remainder of the schools, and suitable sites were being negotiated in the various villages. Recruitment was completed for an additional 30 qualified teachers and several educational technicians. Plans were completed for an educational television studio and contracts were let for most of the television equipment.

## Health Advances

The Hawaii Medical Association continued to support Samoa's medical program by providing several outstanding surgeons and other medical doctors. A team of doctors from the University of California at Los Angeles also spent several months starting the filariasis-control program. By year's end, three additional doctors had been recruited and plans were begun for building a new hospital.

## AGRICULTURE TO EXPAND

Due to the lack of trained personnel, little additional progress was made in the field of agriculture. However, by the end of the fiscal year a new director and entomologist and several other employees reported for duty and plans were laid for a greatly expanded agriculture program.

### Legislature Meets

During the late fall and winter months, a tax expert from the U.S. Treasury made a comprehensive study in this territory. This was followed by conferences with the Government, and the Departments of the Interior and Treasury officials in Washington, and a far-reaching tax-reform bill was completed. The legislature was called into special session in early January and the tax-reform bill was presented. In general, the tax-reform measure called for the repeal of oppressive import duties on food, clothing, and other essential items that were responsible for the high cost of living. It also adopted the U.S. income tax as the major revenue-producing tax for the government of American Samoa. The tax measure was opposed by a few businessmen, but the Samoan people wholeheartedly supported it. The reform measure was passed by a 14–1 majority in the senate and a 12–5 majority in the house of representatives. While opponents of the bill had predicted that the cost of foods and other essential items would rise greatly as a result of the tax program, by year's end prices had begun to drop and purposes of the tax-reform measure were beginning to have the desired effect.

## ECONOMIC DEVELOPMENT SPURRED

During the year, lease arrangements were completed with four new industries and all of them were under construction. These included a fish-processing firm, a can company, a coconut processing corporation, and a soft-drink bottling company. The Samoan Development Corporation, while slow in obtaining the necessary capital, finally added over 1,000 Samoan stockholders

Major shareholders signed papers for the Samoan Development Corporation at Legislative Hall in Fagatogo, American Samoa, as Governor H. Rex Lee and Congressman Wayne Aspinall (first row, third and fourth from left) watched.

and a quarter of a million dollars in subscriptions. The corporation was completely organized, an architect was hired, and preliminary plans were made for a hotel.

### Public Works Undertaken

With completion of the agreements for the four new industries that were to occupy the old public works compound, it was necessary to build a completely new compound in the airport area. This was completed with money paid by the companies for the original site and was in full operation by the end of the fiscal year. Also during the year the government supported the construction of Federal Aviation Agency facilities at the new airport by providing heavy equipment and personnel. It gave substantial support to a special Federal Government project centering on construction, housing, and related facilities.

## GUAM BESET BY STORMS

Fiscal 1963 was a tragic one for Guam, the Nation's westernmost territory, which still struggled to recover from the ravages of enemy occupation and bombardment of World War II.

The island was battered November 11–12, 1962, by Typhoon Karen, with winds of over 235 miles per hour, strongest ever to lash a landmass. Devastation was compared by military men to that from a nuclear bomb without the heat or fallout. Nine persons were killed, public facilities were demolished, and more than 7,000 homes and buildings were destroyed.

Acting Governor Manuel Guerrero launched an ambitious rehabilitation program designated to erase the scars of Karen and to upgrade living standards generally. And then another storm struck.

Typhoon Olive, with winds of over 100 miles an hour, raked the island for almost 48 hours April 28–29, destroying to a great extent all facilities which had been restored after Karen.

Many Federal agencies became closely involved in Guam's recovery program and an extensive loan-grant request was made to Congress for financing long-range redevelopments.

The Office of Emergency Planning allocated about $14 million for repairs of public facilities and this money was programed for construction of a more permanent nature to withstand future typhoons.

Extensive surveys of Guam's problems by officials of the territorial and Federal Governments after the typhoon developed a firm conclusion that about 80 percent of the island ills could not be blamed on the storms, but have existed for years.

Buildings, homes, and public facilities leveled by bombardment in 1944 had, for the most part, been replaced on a piecemeal, tempo-

Buildings such as this one in Agana are sprouting up all over Guam to replace typhoon destroyed structures.

rary basis, although $25 million had been spent in capital improvements since the civil government was formed in 1950.

Prewar villages had never been properly replanned and most of the island's housing was substandard.

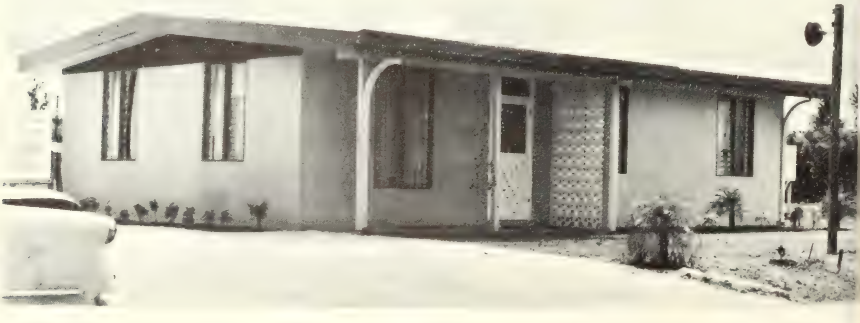
Guam closed the fiscal year on a note of optimism with a determination to rebuild on modern standards and make the island truly an American community. Many commercial firms were constructing new buildings. Plans for a new high school and other school facilities were being drawn. The Guam Legislature passed several emergency measures regarding the recovery program and was studying several measures for reorganizing some departments, including Medical Services and Education, the latter designed primarily to strengthen the College of Guam, which had just been accredited as a 4-year institution.

Passage of a bill extending urban renewal programs to the island was sought in Congress, and the Housing and Home Finance Agency was preparing to aid in planning redevelopment of villages.

The Small Business Administration, which opened a disaster office in Agana following Typhoon Karen, had approved over $6 million in disaster loans, chiefly for homes.

The legislature authorized the sale of territorial land below market value to subdividers, and major contractors submitted proposals for large developments to include concrete homes within the price range of Guam residents.

The government was completing an agreement with the Navy for a survey of Apra Harbor in order to relocate the commercial port where facilities can be expanded and an industrial area developed.



This model home in a Guam subdivision is setting the pattern for a vast housing program

Negotiations also were underway for transfer of Navy land adjoining the naval air station for constructing a badly needed civilian air terminal.

The military announced plans to spend $70 million on rehabilitation construction and this, coupled with an expected expenditure of over $60 million by the government and the civilian community, insures a stable economy for Guam for about 5 years. From this should emerge a more substantial community and greatly improved living standards.

But government officials at all levels are turning their attention to development of a firm economy which will not depend solely on construction. This would prevent an economic collapse after the stepped-up construction programs end.

In the past 2 years the island had made strides in redeveloping agriculture, which had become almost a lost art. Despite setbacks from the typhoons, this program is being revitalized by the Government of Guam Department of Agriculture.

The entire community is pushing for development of tourism. An Australian tour ship began calling at Guam each month with visitors who were enthralled by the island's beauty. New motel units were being built and construction of a resort hotel appeared probable.

Extensive experiments were being conducted in the seas around Guam, aimed at development of a fishing industry.

Efforts were being made to encourage establishment of industrial enterprises which could operate in Guam despite the lack of natural resources.

A concerted drive was underway to improve medical services and other governmental operations which would attract investors and developers.

# TRUST TERRITORY OF THE PACIFIC ISLANDS SCHEDULES SCHOOL CONSTRUCTION

A major event of the year was the passage by Congress in July 1962 of an authorization bill setting a new appropriation ceiling of $17,500,000 for the Trust Territory, with $15 million authorized for fiscal 1963. A supplemental budget was passed May 17, 1963 bringing the 1963 budget total to the new level. This was an increase of more than 100 percent over the prior year's appropriation. Of the increased appropriation, $4 million was earmarked for the accelerated elementary school construction program and $3,300,000 in other construction.

Jurisdiction of the former Saipan District was transferred from the Secretary of the Navy to the Secretary of the Interior July 1, 1962, thus unifying the entire Trust Territory under civilian administration. This transfer also made possible the amalgamation of the former Saipan and Rota Districts into the Marianas Islands District. Also, Saipan Island was designated the first provisional capital of Micronesia following the move of the Trust Territory Headquarters from Guam to Saipan July 1, 1962. These long-sought events created increased cooperation among the people of the territory and stimulated greater political cohesion.

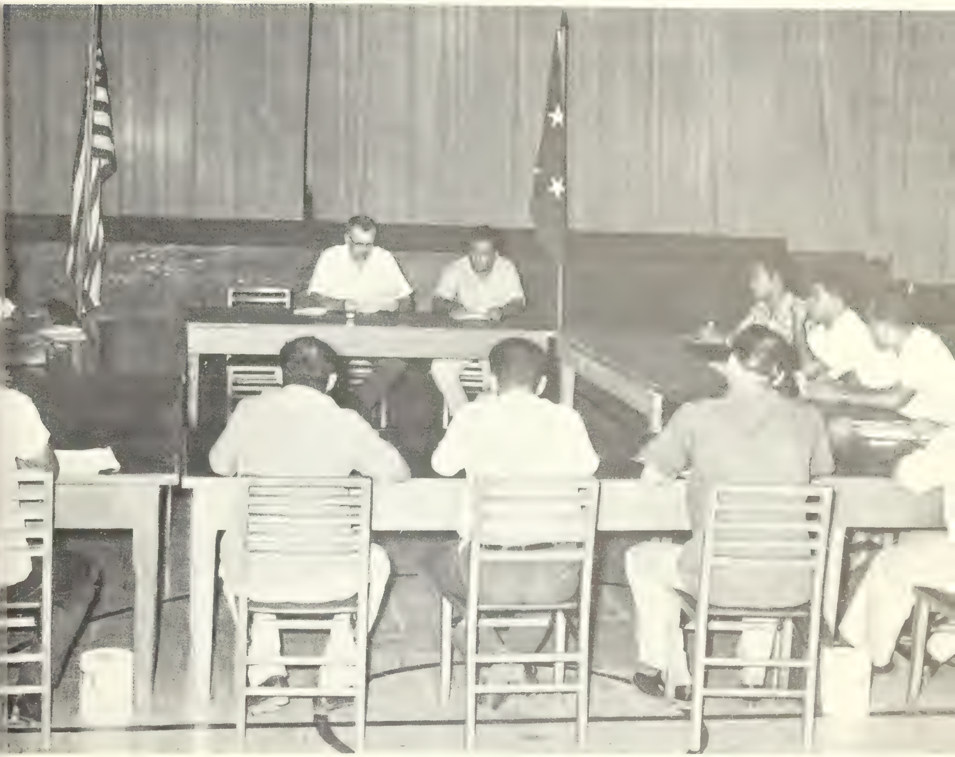
Transportation service in the territory was improved with the addition of a DC–4 aircraft with 60-passenger capacity and sizable cargo capacity. An additional 3,500-ton vessel (former *North Star II,* renamed *Pacific Islander*) was acquired from the Bureau of Indian Affairs. A new 4,800-foot airstrip was completed in Yap. Construction of another airstrip in Babelthuap, Palau, began.

Security regulations governing entry of U.S. citizens to the Trust Territory were removed, except for those areas still under the control of the Department of Defense, thus stimulating U.S. financial interest in the area.

A major accomplishment of the year was the signing, by the Trust Territory Government and a seafood company of a basic agreement under which the company will establish a commercial fishing industry in the Palau District. The agreement calls for sizable shore installations for freezing tuna as well as training of Micronesians in both ashore and afloat fishery operations. At year's end, an additional branch bank was to be opened on Ponape A Micronesian Products Center, a nonprofit handicraft outlet sponsored by the Trust Territory Government which was opened in Guam in July 1962, sparked the formation of Palau Woodworkers' Guild and has reactivated various women's organizations in the territory in making handicraft and appreciably increasing handicraft sales.

Exportation of vegetable produce and marine products, especially to Guam, reached a new record.

With the technical assistance provided by the newly created Political Affairs Office on the High Commissioner's staff, politica development in the territory received new attention, The Counci of Micronesia met twice during fiscal 1963. At its first session the council adopted an official Trust Territory flag and approved



ne Special Session of the Council of Micronesia convened in Saipan, Mariana Islands,
March 1963 to discuss the composition and functions of the proposed Territorial Leg-
ature for the Trust Territory of the Pacific Islands.

resolution calling for a territorial legislature. At a special ses-
ion in March 1963, the council recommended creation of a bi-
ameral legislative body. The council's recommendation was taken
nder consideration by the High Commissioner. The Mariana
slands District Legislature was formed in early 1963. A move
o strengthen district congresses was underway.

An accelerated elementary school construction program was fully
nderway. This calls for the construction of 240 classrooms and
ne recruitment of 140 elementary school teachers for fiscal 1964.
xcept for the Yap District, which expects to add a 10th grade to
s junior high school program, all Trust Territory districts were
heduled to add the 11th grade to their secondary school program
t the start of the 1963–64 school year. District scholarship
wards were increased from three to five scholarships for each
istrict.

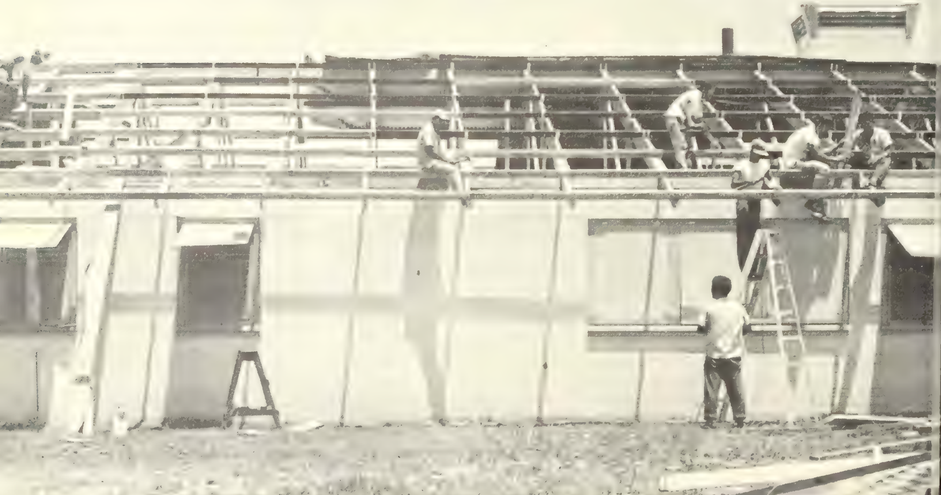
Recruitment of six American doctors to be stationed in the district hospitals to augment existing medical staff was underway. A poliomyelitis epidemic in the Marshalls affected over 200 persons, mostly children. As a preventive measure, all residents of the territory were being vaccinated with oral vaccine.

Typhoon Olive swept over the Marianas District April 30, 1963, leaving in its wake damage estimated at over $2 million. The President immediately declared the affected islands a "major disaster area" and Federal financial assistance was requested. By year's end, $1,300,000 in Federal aid had been authorized for rehabilitation work.

## VIRGIN ISLANDS DEVELOP RAPIDLY

Fiscal 1963 was a year of remarkable progress in the Virgin Islands. A new pay plan for territorial employees was adopted by the legislature, providing better recruitment and holding potential, general salary increases and substantial salaries for teachers doctors, nurses, and other professional personnel.

The first class of the Virgin Islands College consisted of 46 full-time freshmen and 190 part-time students. The faculty is composed of leading educators. Supporters hope that the college wil



Public works crew is shown replacing the roof of Torres Memorial Hospital in Saipa after Typhoon Olive unroofed the hospital buildings.

. Sargent Shriver, Jr., Director of the United States Peace Corps, is shown dedicating a
ree-room school building in St. Thomas, Virgin Islands, one of two such buildings
onstructed by members of the Peace Corps who were in training here for work in Gabon.

ring a new level of educational experience to every island resident
nd will enhance the cultural level of the entire area.

In elementary and secondary education, dimensions of progress
vere many and varied. Instructional programs were improved
ubstantially and teacher-pupil ratio was reduced. With employ-
nent of a qualified professional staff, it was possible to start the
nassive tasks of coordinating curriculum development, stepped-
p training programs, and improved school administration. The
econdary Commission of the Middle States Association of Sec-
ndary Schools and Colleges evaluated the secondary schools of
he islands and its report spoke of progress in many areas as well as
ecommendations for improvement. By year's end, 38 new class-
ooms had been added, 24 were under construction, and funds were
ppropriated for 28 additional classrooms in public schools through-
ut the islands.

Health conditions in the Virgin Islands continued to be excellent
'here was an overall improvement in mortality statistics, with new
ows being reached in the death rate (9 per thousand population);
ıfant death (29.1); neonatal death rate (20.4); maternal death
ate (0); and fetal death rate (35.6). The live birth rate increased
rom 34.7 to 38.8 per thousand population. Medical and Public

Health services were expanded and improved as a new professional staff was recruited. Extensive remodeling was accomplished at the Charles Harwood Memorial Hospital in St. Croix. Construction of residence quarters for house physicians in St. Thomas started. In St. John, work began on extensive renovation and remodeling of a clinic, and plans were completed for construction of nurses' quarters.

Funds were made available late in the year for remodeling and reassignment of areas in the Knud Hansen Memorial Hospital in St. Thomas to provide badly needed additional medical beds. Funds also were provided for a survey of and planning and designs for completely new hospital facilities in St. Thomas and St. Croix projected to start within 5 years.

In the Department of Social Welfare, the Herbert Grigg Home for the Aged continued to improve and expand its program. Funds were appropriated for an addition to the Queen Louise Home for the Aged in St. Thomas. Plans were prepared by a Swedish architectural specialist for a public housing facility for the aged in St. Thomas.

The Department of Housing and Community Renewal was organized, effectively coordinating all public housing and urban renewal activities in a single cabinet-rank agency. Under the Virgin Islands Housing Authority, the Oswald Harris Court, a 300-unit federally financed public housing development in St. Thomas, was dedicated. Another federally financed public housing project consisting of 264 units in St. Croix to be known as the Ralph de Chabert Place was to be ready for partial occupancy during August 1963.

Four projects totaling 480 units were in the planning stage, one of them being almost ready for advertisement. In locally financed public housing, 8 middle-income homes were completed in St. Thomas and 16 units of emergency housing in St. Croix. At year's end, 88 additional units of emergency housing were under construction and a contract was executed for 50 additional middle income homes. Under the Federal Housing Act of 1961, plans were in preparation for 129 apartment units to be financed by a low-interest Federal mortgage loan.

Tourism, industrial development, and commerce were at a record high. Bank deposits and bank loans reached a new high of $52 million and $32 million, respectively. Revenues from tourism increased from $35 million to $40 million. Some 319,000 visitors arrived in the Virgin Islands, compared with 291,000 in the previous year. A record of 64,239 cruise-ship passengers visited St. Thomas, an increase of 6,440, while 1,864 cruise-ship passengers

ne of the largest and best run charter fleets in the world operates from St. Thomas in the irgin Islands offering exciting opportunity for sea voyages.

came to St. Croix. The islands' industrial development program was deterred by legislation introduced into the U.S. Congress. Such legislation was designed to eliminate certain advantages accorded to the Virgin Islands under section 301 of the Tariff Act of 1930. Even so, eight new manufacturing industries were established. By year's end the territorial government had taken positive steps to plug loopholes in the operation of such industries so as to maintain the economic stability as well as the commercial relations of the islands.

In the agricultural program of the islands, new crop trials were highly successful with emphasis on market developments, to provide a more diversified agricultural economy. Losses in the sugarcane industry and the almost certainty of the phasing out of sugar in the next few years caused new emphasis to be placed on agricultural programs.

In the Department of Public Works substantial improvements were made in basic responsibilities of housekeeping. Garbage collection was increased fourfold. One mile of the Centerline Road on St. John was reconstructed and paved as well as several streets on St. Croix and St. Thomas. Designs were completed and construction started on nine school projects, seven road projects, a wharf at Christiansted, St. Croix, and a dredging and bulkhead project in St. Thomas.

Revenues of the territory were at a new high of nearly $12 million, an increase of nearly 8 percent over fiscal 1962. To meet the ever-increasing cost of new and expanded government operations and the new pay plan, an increase in local gross receipts taxes from 1 percent to 2 percent was passed by the legislature to become effective July 1, 1963. Considerable improvement was made in reorganizing the Tax Division of the Department of Finance to strengthen enforcement and collections.

The Department of Law functioned effectively in drafting legislation, preparing legal opinions, and representing the government in 5,000 matters in the municipal courts, 21 in the district court and two appeals before the Circuit Court of Appeals for the Third Circuit.

In the Department of Public Safety, a rise in the crime rate due to increasing population has sparked establishment of new methods and techniques and the addition of several new police specialists who should be available early in fiscal 1964. A training program in modern law enforcement techniques was conducted in conjunction with the Cincinnati Police Department.

The Department of Property and Procurement completed an inventory of all government-owned property and full accountability therefor was established.

## Virgin Islands Corporation Active

Two far-reaching major policy decisions, affecting both the economy of the Virgin Islands and the future of the Virgin Islands Corporation (VICORP), were reached during the year.

The VICORP Board of Directors, after many meetings and much discussion, decided to phase out the sugar operation in St. Croix by determining that the final grinding season of the sugarmill would be 1966. Meanwhile, 1,700 acres of sugarcane land were put out for public bid with the hope of attracting either a new industry or a new type of agricultural crop. Although all bids were rejected, negotiations were in progress with the most promising of the bidders for long-term lease of the land. Congress turned down a $4,030,000 request by the VICORP Board to expand power facilities in St. Thomas and St. Croix. They supplemented this action by suggesting that the entire operation be turned over to the local government. A thorough study of this possibility was undertaken by the board.

The combination of a heavier-than-usual rainfall and a higher-than-usual sales price produced a good sugar season and will result in a net profit of approximately $150,000 (as opposed to a loss in the previous crop of $433,689) in the sugar operations for the first time in many years. A flat 15-cent wage increase was given over 200 mill employees at the start of the 1963 season. Grinding started February 6, 1963, and ended June 18, 1963, with 151,199 tons of sugarcane ground, resulting in 15,353 tons of raw sugar.

Both divisions of the Power Department showed substantial profit increases during the year despite 10 to 30 percent wage increases given all power employees. The increase of peakload in St. Thomas continued at a rate of 16 percent while in St. Croix the increase was 12.3 percent. Two new diesel generators were installed, a 3,000-kw. on St. Thomas and a 2,216-kw. on St. Croix. Both operated successfully, but additional generation is badly needed immediately if future power shortages are to be avoided.

The salt water distillation plant, with an average daily output of 325,000 gallons, operated with a minimum of shutdowns. However, the increase of use in St. Thomas still leaves the island with the need for an additional 500,000 gallons per day. For the calendar year 1962, costs were approximately $2.37 per 1,000 gallons

Magens Bay at St. Thomas, Virgin Islands, offers a fine white beach and clear blue water for swimming and water sports.

A survey which produced better management for the land and buildings handled by VICORP for the U.S. Navy in St. Thomas was made during the year, and this, coupled with new rental schedules, wiped out the Development Department deficit and created a surplus for future use. This money will be used for renovating the low-rent housing project at Bourne Field. Plans which would transfer all Navy land on St. Thomas to VICORP for commercial development were underway.

The water and soil conservation program was transferred to the local government. The forestry program was turned over to the U.S. Forest Service. The lumber and fencepost program were leased temporarily to private interests. VICORP contemplates discontinuing the cattle program.

## Comptroller's Office Increases Audits

The Office of the Government Comptroller of the Virgin Islands is a Federal agency under the general supervision of the Secretary of the Interior. It is responsible for auditing the income and expenditures of the Territorial Government of the Virgin Islands.

As a result of increased use of limited audits during fiscal 1963, this office submitted 29 reports of audit, 16 more than during the preceding fiscal year. Several of these pointed out deficiencies in the handling of receivables by the Government of the Virgin Islands, which in turn should result in increased recoveries by the local government.

In addition, as required by law, the certification of the net amount of government revenues which form the basis for Federal grants for the civil government of the Virgin Islands, for the fiscal year 1962, was submitted to the Secretary of the Interior, and the annual report of the fiscal condition of the Government of the Virgin Islands was submitted to the Governor, the Comptroller General of the United States, and the Secretary of the Interior.

# The Alaska Railroad

John E. Manley,
General Manager

Net income for The Alaska Railroad in fiscal 1963 was $285,406.48, an increase of $32,306.07 over the previous fiscal year During the year the railroad had total revenues of $14,893,839.0 and expenses of $14,608,432.61. The expenses included $2,154,729.43 in depreciation charges.

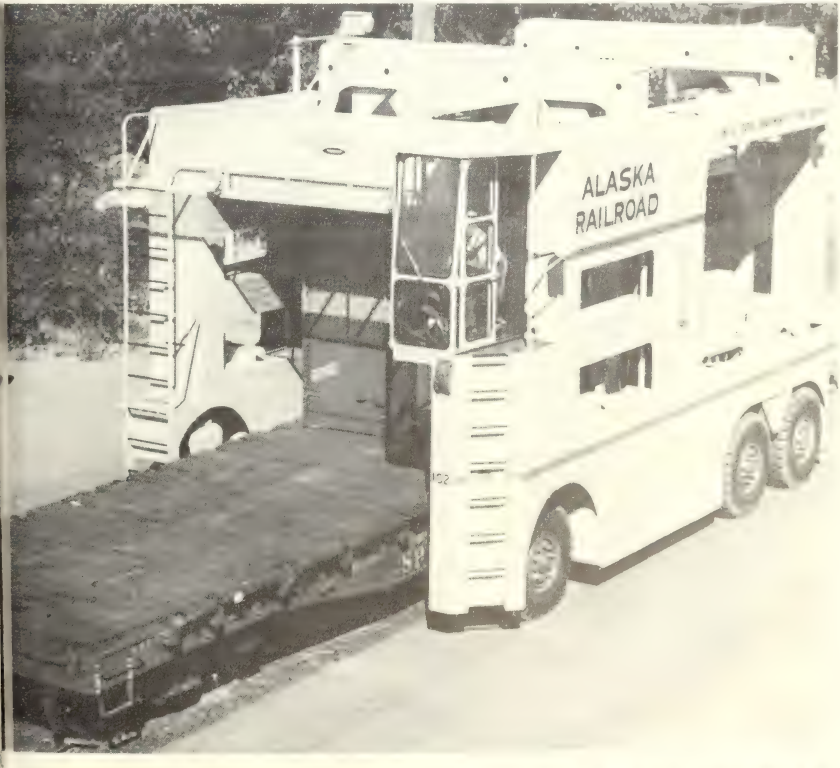
The railroad carried 1,449,133 revenue tons of freight in fisca 1963, an increase of 1,137 tons over 1962. Passenger traffic declined, revenue passengers totaling 63,682, compared with 67,41 in fiscal 1962. Revenue per passenger increased, however, wit the result that total passenger revenues for the year were approximately $14,000 higher than in 1962.

A program to improve operating methods continued. Trac maintenance was accelerated through use of an electromati tamper. This machine, with a 4- or 5-man team, is capable of performing work that with older machines required 20-man teams Four other machines, each capable of extracting and inserting ties were placed in service. Assigned in pairs, one machine extractin and the other inserting ties with 15-man gangs, work now is accomplished that formerly required 40-man gangs.

Protection against service interruptions was provided by installing an air dryer that pressurizes communications cables.

To cut the cost of delivering bulk grain to feed-mixing plants i the Matanuska Valley, a tilt hoist was acquired for use with self dumping containers. Movement of freight in containers over th Seward Dock was accelerated by using "straddle trucks" or va carriers. Further improvements in freight handling will be pos

laced in service during May 1963, this 2,250 horsepower diesel locomotive replaced nother severely damaged by a snow slide in November 1961.



ovements of freight containers away from shipside are made rapidly with specially signed straddle trucks.

sible when three modified revolving gantry cranes are installed on the dock.

A 2,250-horsepower diesel-electric locomotive was placed in service in May 1963. It replaces a locomotive damaged beyond economical repair in a snowslide during November 1961, but it also marked the beginning of a program to "phase out" old, obsolete locomotives acquired from surplus after World War II. Purchase of a similar locomotive during fiscal year 1964 has been approved.

With the signing of Executive Order 11107 by the President April 23, 1963, The Alaska Railroad was placed under Interstate Commerce Commission regulation for purposes of ratemaking. Thus, independent review of the reasonableness of railroad tariffs may be obtained should questions arise concerning rate applications.

# Office of the Assistant Secretary Water and Power Development

Kenneth Holum, Assistant Secretary

# Office of the Assistant Secretary Water and Power Development

## Kenneth Holum, Assistant Secretary

The Assistant Secretary for Water and Power Development acts for the Secretary in implementing the Department's water and power programs. He exercises secretarial direction over five bureaus—the Bureau of Reclamation, Bonneville Power Administration, Southeastern Power Administration, Southwestern Power Administration, and the Office of Saline Water.

The Bureau of Reclamation is the oldest and largest of these agencies. It constructs water-use projects primarily for the reclamation of arid and semiarid lands in the West and, excluding the Bonneville Power Administration's area, markets electric power in the 17 Western States from projects built by itself, the International Boundary and Water Commission, and the Corps of Engineers.

The Bonneville, Southeastern, and Southwestern Power Administrations have a single function—the marketing of power. Along with the Bureau of Reclamation, they sell all electric power generated by Federal water-resource development projects and acilities.

Toward the end of fiscal 1963, Bonneville's operations were exended by Secretary Udall to southern Idaho, so that Bonneville's marketing area now includes all of Idaho, Washington, and Oregon, plus that part of Montana west of the Continental Divide. Southeastern sells power in Southeast States. Southwestern sells in the Central Southwest States.

The Bureau of Reclamation, Bonneville and Southwestern Power

Sailboating is one of many water sports enjoyed by visitors to Colter Bay Bureau of Reclamation reservoir on the Minidoka Project, on Wyoming's Snake River in the shadow of the Grand Teton Mountains.

Administrations operate extensive high-voltage transmission systems. Activity continued through the year toward the Department's goal of interconnecting certain Federal systems, including a high-voltage intertie between the Pacific Northwest and Pacific Southwest and an interconnection between the Southwestern Power Administration and the Bureau of Reclamation. Bonneville continued its experiments with direct-current, high-voltage transmission, expected to provide much greater efficiency over long distances than the alternating-current transmission now used in this country.

Power is marketed under the following set of principles established by Congress and by policy:

1. Preference in power sales shall be given public agencies and cooperatives.
2. Domestic and rural consumers shall have priority over other consumers in the disposal of power.
3. Power shall be sold at the lowest possible rates consistent with sound business principles.
4. Power disposal shall be such as to encourage widespread use to prevent monopolization.

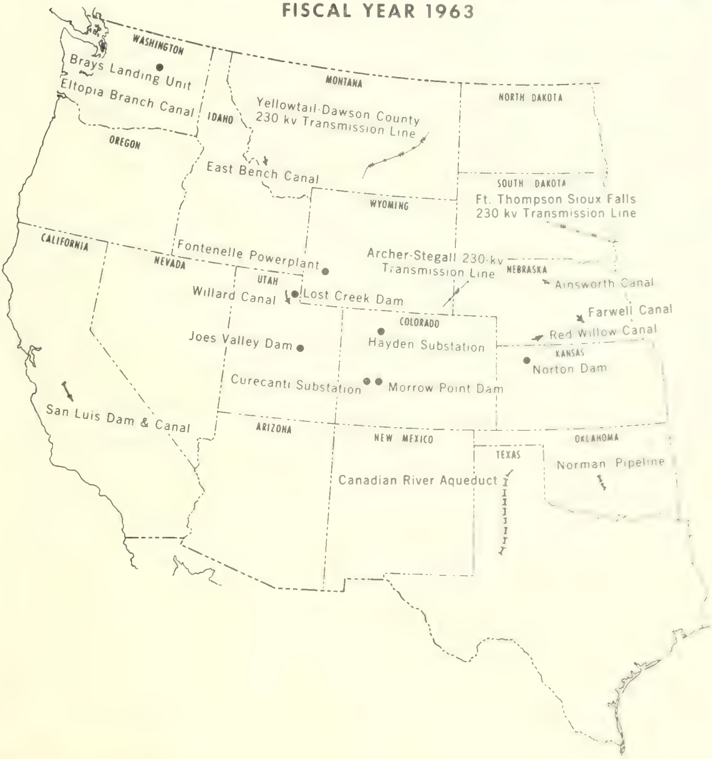
The Department's search for low-cost methods of producing acceptable fresh water from sea water, or from other saline waters, moved to the threshold of economically practical utilization during the year. A preliminary feasibility study by the Office of Saline Water of a sea-water conversion plant for the lower Florida Keys indicated a product water cost of 65 to 70 cents per 1,000 gallons, compared with $1 to $1.05 per 1,000 gallons for water supplied by a new pipeline of equal capacity. Based on this apparent competitive advantage of the potential desalting plant, the Department started detailed engineering and financial feasibility studies leading toward construction of such a plant.

The Office of Saline Water continued to expand and accelerate its basic and applied research. A brackish-water conversion demonstration plant, with a capacity of 1 million gallons a day, began operating at Roswell, N. Mex., and a contract was awarded for constructing a freezing-process conversion plant, with a capacity of 200,000 gallons a day, at Wrightsville Beach, N.C. A Research and Development Test Station was completed at Wrightsville Beach for the experimental operation of new or improved processes at the pilot-plant level.

Certain defense functions regarding electric power have been delegated to the Department. These are discharged by the Assistant Secretary for Water and Power Development through his direction of the Defense Electric Power Administration. Under this program, a field organization stands ready to handle specific power problems in case of enemy attack. The Defense Electric Power Administration consists of 16 power areas in the continental United States and 3 others—Alaska, Hawaii, and Puerto Rico-Virgin Islands—each headed by a director with a deputy and alternate deputy, all serving on an unpaid basis. Power liaison personnel have been appointed to each of the Office of

**MAJOR CONSTRUCTION CONTRACTS**

**FISCAL YEAR 1963**



Emergency Planning-Office of Civil Defense regional offices. There also is a liaison man in every utility in the nation, public and private, and in most of the local civil defense offices.

During the year, the Office of the Assistant Secretary for Water and Power reviewed 67 reports of the Corps of Engineers, Department of the Army, primarily for flood-control and navigation improvements; 45 Federal Power Commission applications for permits and licenses to build hydroelectric projects; and 61 Department of Agriculture watershed work plans.

*Power production and marketing data, fiscal year ended June 30, 1963*

| Marketing agent | Installed capacity as of June 30, 1963 (kilowatts) | Net energy generated (million kilowatt-hours) | Energy marketed (million kilowatt-hours) | Gross revenue (thousands of dollars) | Percent of power marketed to preference customers |
|---|---|---|---|---|---|
| Bureau of Reclamation | [1] 6, 984, 985 | 29, 117 | [2] 16, 178 | [3] 62, 291 | [4] 85. 9 |
| Bonneville Power Administration | [5] 4, 237, 000 | [6] 19, 838 | 30, 183 | 79, 536 | [7] 42. 4 |
| Southwestern Power Administration | [8] 791, 000 | 1, 417 | 1, 747 | 17, 605 | 64. 6 |
| Southeastern Power Administration | 1, 612, 000 | 3, 939 | 3, 898 | 22, 559 | [9] 46. 8 |
| Total | 13, 624, 985 | 54, 311 | 52, 006 | 181, 991 | |

[1] Of this total, 5,373,450 kilowatts in Bureau of Reclamation plants; 1,580,035 kilowatts in Corps of Engineers plants; and 31,500 kilowatts in the International Boundary Water Commission plant.

[2] Excludes 11,987,000 kilowatt-hours delivered at Grand Coulee, Hungry Horse, Chandler, and Roza powerplants by Bureau of Reclamation to Bonneville Power Administration.

[3] Excludes $12,095,000 in revenue received by Bureau of Reclamation from Bonneville Power Administration.

[4] Excludes energy delivered to Bonneville Power Administration.

[5] Excludes capacity from Bureau of Reclamation powerplants from which Bonneville Power Administration markets power. This capacity totals 2,252,250 kilowatts at Grand Coulee, Hungry Horse, Chandler, and Roza powerplants.

[6] Does not include generation at Bureau of Reclamation projects.

[7] Excludes deliveries to Federal agencies.

[8] Capacity in Corps of Engineers projects.

[9] In addition, 43.3 percent of the total energy was marketed to the Tennessee Valley Authority.

# Bureau of Reclamation

## Floyd E. Dominy, Commissioner

In New Mexico, a little Navajo girl, who had never seen a large body of water, happily frolicked away the hot summer afternoons by a cool lake created in the desert. In Arizona, a young boy, fishing in the Colorado River below the nearly completed Glen Canyon Dam, experienced the great thrill of catching his first trout. In Moline, Ill., a father found employment in a factory making earth-moving machinery. A family in a suburb of Phoenix, Ariz., had ample water for drinking, washing, and other household uses in a new home on a plot of ground that was formerly uninhabitable desert. A trucker in California bought several new vehicles for his fleet to carry produce to market. A general store and a cafe were opened near the site of Yellowtail Dam to serve construction workers on the big Reclamation job. Youngsters in Chicago got their vitamin C during the sunless winter months from oranges and other citrus fruits grown in the Pacific Southwest. And a farmer in far-off Afghanistan had his first good wheat crop in several years because his land was properly irrigated.

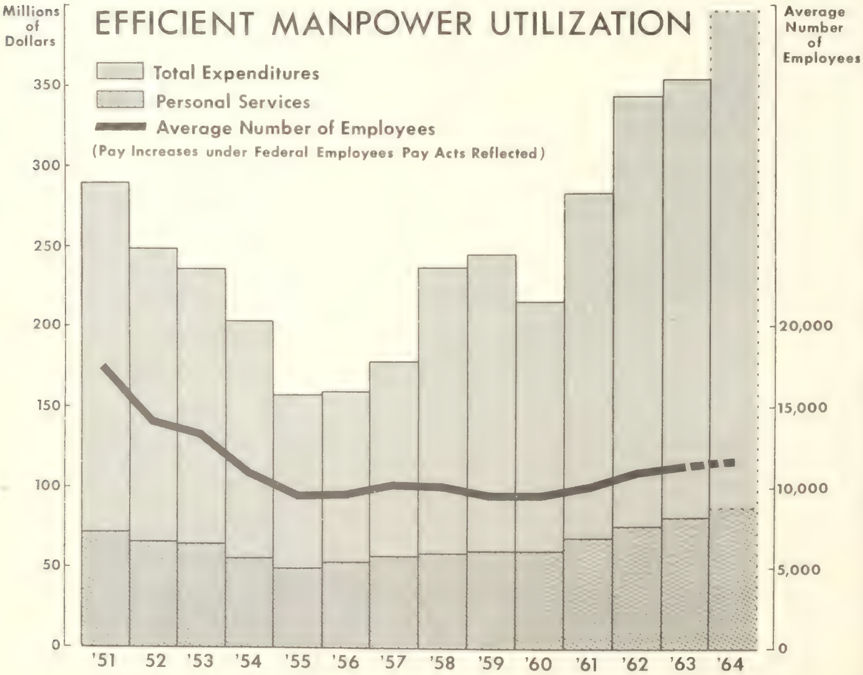
All these events, matched by countless similar ones, resulted from Bureau of Reclamation activities during fiscal 1963.

The same activities are also responsible for many things that will happen in the future—the delight of thousands of tourists who will have the opportunity to view Rainbow Bridge above Glen Canyon Dam and engage in camping and water sports along the 186-mile-long Glen Canyon Reservoir, the growing of better pineapples on the island of Molokai in Hawaii, the generation of reasonably priced electric energy for further industrial development of the Missouri River Basin and the Upper Colorado River Basin, the settlement of towns in presently arid localities which have had no assured municipal water supply, and many other results that occur when the priceless resource of water is controlled and put to beneficial use by map.

## NEW PRODUCTIVITY RECORD SET

In carrying out its 1963 program, the Bureau of Reclamation set a new record in achievement. Both in construction accomplished and in efficient utilization of manpower, the Bureau reached a pinnacle of performance never before attained in its 61-year history. Work completed reached 88 percent of the scheduled financed program, topping the previous high of 87 percent effected in 1962. The 1963 record came gratifyingly close to Reclamation's ultimate goal of 90 percent production.

More than $360 million were converted into useful Reclamation works and services, compared to $347 million in fiscal 1962. This 1963 work record was accomplished with an average of 11,402 Reclamation employees, a modest increase of 426 over the 10,976 of 1962. The slight increase in agency personnel was more than offset by the greater production of 1963, plus the services rendered on the authorized unscheduled work.



The 1963 employment figure represents 65.3 percent of the peak employment of 1951, when an average of 17,455 persons completed work valued at only $289.6 million. In other words, 11 years ago the Bureau accomplished work at the rate of $16,591 per man-year, while in 1963 the rate was $31,230 per man-year. In 1955, the lowest postwar year in dollar volume of work produced, 9,712 employees did work valued at $157.9 million, at the rate of $16,260 per man-year. Since then, Reclamation's productivity has much more than doubled, measured in current dollars, while its employment has increased only 17 percent.

The sum of over $360 million invested during fiscal 1963 covered all expenditures financed from Federal and non-Federal funds, including Federal funds transferred to other Government agencies, as provided in the Appropriations Act. Of the total, some $350 million represented work performed by the Bureau on its own program scheduled in the amount of $412.4 million, but financed to the extent of $399.3 million. It excluded expenditures from permanent appropriations, as well as other authorized work by Bureau forces adding up to about $5 million, and expenditures of approximately $5 million incurred by other agencies from transferred funds.

## Many Construction Highlights

The major role of the Bureau of Reclamation in developing water resources of western United States during fiscal 1963 is evident from a summary of construction accomplishments. The agency completed irrigation facilities to serve 362,665 acres of land (in crop year 1962) and installed 80,500 kilowatts of hydroelectric generating capacity. Construction was completed on six storage dams having a combined capacity of 2,402,000 acre-feet; six diversion dams; 469 miles of canals, pipelines, laterals and drains; and 1,079 miles of high-voltage transmission lines.

The investment of about $135 million represented by 305 construction contracts completed for these and other Reclamation features brought the Bureau's total investment in project facilities to nearly $4 billion.

Awarded during the year were 942 construction, material, equipment, and supply contracts, valued at about $209 million. Contracts solely for construction were about $189 million, or about 90 percent. The 158 contracts for construction work in progress at the end of fiscal 1963 represented a total value of approximately $548 million.

Construction costs on Bureau of Reclamation projects increased about 1 percent during the year. For the same period, construction wage rates increased about 4 percent. Most construction material costs remained quite stable.

Bidding interest in Reclamation construction work averaged 7.1 bids per schedule, the highest since fiscal year 1960. This compared with an overall average of 6.4 bids per schedule for the past 10 years.

The total of all low bids received for construction schedules was about 97½ percent of the total for the engineers' estimates, with the average of the three low bids for each schedule about 102 percent of the engineers' estimates.

Unparalleled in any period of Reclamation construction history was the number of dams under construction—21—and the number completed—6. Of the 21 dams, 5 were being built in Utah, 4 in California, 3 in Colorado, 2 each in Kansas and Montana, and 1 each in Arizona, Texas, Nebraska, Oklahoma, and Wyoming. Two of the completed structures are in California, and one each in Oregon, New Mexico, Colorado, and Texas.

A significant event of 1963 was the award of a contract for construction, starting early next fiscal year, on the first of three sections of high-voltage transmission lines that will carry electricity to be generated at new powerplants in the Missouri River and Colorado River Basins. The lines will also interconnect the Federal transmission systems of the eastern and western divisions of the Missouri River Basin Project with the Colorado River Storage Project and the Parker-Davis Project on the lower Colorado River. The lines, which will total more than 500 miles, will extend from Oahe Dam and Powerplant on the Missouri River in South Dakota to a substation of the Colorado River Storage Project transmission system in western Colorado, interconnecting Federal power facilities from Montana to Arizona, from California to Minnesota.

## San Luis Unit of Central Valley Project Starts

Another highlight of 1963 was the start of major construction on the Central Valley Project's San Luis Unit, a unique Federal-State arrangement for joint use of the most feasible site for large-scale water storage on the western side of the San Joaquin Valley. Construction will provide facilities for storing a million acre-feet of water to irrigate project lands on the west side of the San Joaquin Valley, and an additional 1,100,000 acre-feet of water for use by the State of California.

The $85,926,608 contract for the three major features of the San Luis Unit is the second largest single contract awarded in Reclamation history, exceeded only by the $107,955,522 contract for construction of the Glen Canyon Dam and Powerplant in June, 1962.

One of the outstanding construction events of the Reclamation program during 1963 was start of work in February on San Luis Dam, which will be the world's third largest earthfill dam. A 78-million-cubic-yard, 3½-mile structure, it will be a major feature

President John F. Kennedy and California Governor Edmund G. Brown press the plungers to detonate two explosive charges and thus break ground for the joint Federal-State San Luis Unit near Los Banos, California in mid-August 1962.

of the San Luis Unit. Also started under the contract was construction of the San Luis Pumping-Generating Plant and the San Luis Forebay Dam, a 3-million-cubic-yard, 2½-mile earthfill structure. The pumping-generating plant will be capable of lifting water 320 feet from the forebay and discharging it into the main reservoir at the rate of 11,000 cubic feet per second, and will have a generating capacity of 380,000 kilowatts when used to produce power from water releases.

Importance of the San Luis Unit to water-resource development in the West was emphasized by the participation of President Kennedy in the groundbreaking ceremonies at the damsite August 17, 1962. That month President Kennedy also demonstrated

Tourists watch water cascading down the spillway of Shasta Dam on the Sacramento River in California as the Central Valley Project dam spills over for the first time in 5 years.

his interest in Reclamation by visiting the area in which the $170 million Fryingpan-Arkansas Reclamation project will be located in Colorado. During the 2-day aerial trip to the West, the President attended power-delivery ceremonies at the Oahe Powerplant on the Missouri River near Pierre, S. Dak.

Late in the year, construction started on the first 16 miles of the giant 103-mile San Luis Canal, a river-size waterway (bottom width 110 feet, top width 260 feet, depth 37 feet, capacity 13,000 cubic feet per second) which will convey vitally needed irrigation and municipal water to the San Joaquin Valley and southern California area.

Elsewhere on the Central Valley Project, construction proceeded according to schedule on major features of the project's Trinity River Division, with several powerplants and dams, as well as the Trinity River fish hatchery at Lewiston Dam, completed. The earthfill Lewiston Dam (height 80 feet, volume 429,000 cubic yards) was completed in May 1963; the same month saw the start of storage in the 253,200-acre-foot reservoir behind the earthfill Whiskeytown Dam (270 feet high, volume 4,463,000 cubic yards), and installation of outlet gates and controls.

Additions to the 230-kilovolt switchyard at Keswick Powerplant to tie in the three Trinity River Division powerplants were completed in November 1962, and the 26-mile-long, 230-kilovolt transmission line connecting the three powerplants with the Keswick Switchyard was put into operation the following month. Also completed in December was the 22-mile-long section of the 230-kilovolt Keswick-Gas Point Road-Cottonwood Transmission Line. At year's end, construction reached the 90-percent point on the Gas Point Road-Elverta, Elverta-Hedge, and Hedge-Tracy 230-kilovolt transmission lines, totaling 222 miles in length.

In the American River, Sacramento, and Friant Divisions of the Central Valley Project, numerous construction projects were finished during the year.

All this development contributed to the increased benefits accruing to California and the Nation from the 25-year-old Central Valley Project, one of the most extensive water conservation systems in the world—a vast complex of dams, reservoirs, hydroelectric powerplants, canals, transmission lines, and other features extending from the Trinity River watershed and Shasta Dam in northern California across more than two-thirds the length of the State—nearly 500 miles—to Bakersfield at the southern end of the San Joaquin Valley.

## Washoe Project Dam Completed

Progress on the Washoe Project, California-Nevada, was marked by completion of the Prosser Creek Dam in December 1962. This is an earthfill structure 157 feet high with a volume of 1,738,000 cubic yards. Its reservoir will have a capacity of 29,900 acre-feet.

## Colorado River Storage Project Feature Completed

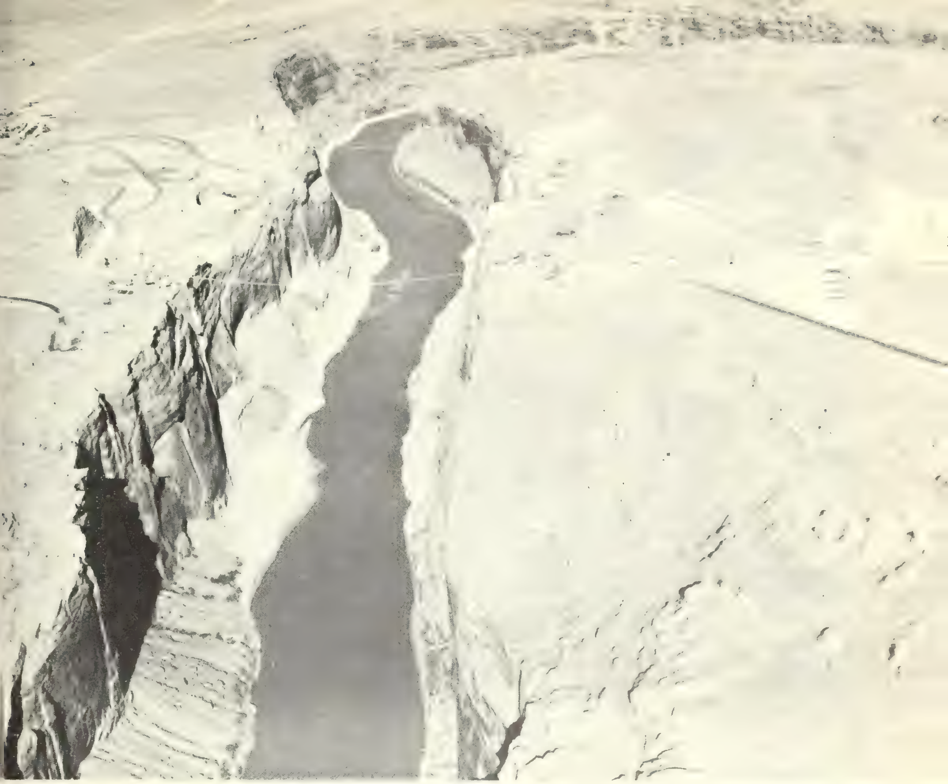
The first principal storage feature of the Colorado River Storage Project was completed in 1963, Navajo Dam on the San Juan River in New Mexico, a 408-foot-high earthfill structure having a volume of 26,250,000 cubic yards. Relocation of the Denver & Rio Grande Western Railroad around the 1,709,000-acre-foot reservoir behind the dam was accomplished in September 1962, setting the stage for a recreation area which will bring pleasure to thousands of visitors and income to the Navajo Indians and other local residents.

A major milestone in developing the Colorado River Storage Project was the "toppin out" of Flaming Gorge Dam on the Green River in Utah. A thin-arch concrete structure, it is 502 feet high. Storage of water in the 3,789,000-acre-foot reservoir began in November 1962, and by the end of the fiscal year more than 350,000 acre-feet of water had been impounded. Also at year's end, work on the 108,000-kilowatt Flaming Gorge Powerplant had progressed to the extent that two of the plant's three turbines had been installed and the first of the three 36,000-kilowatt generators was ready for testing.

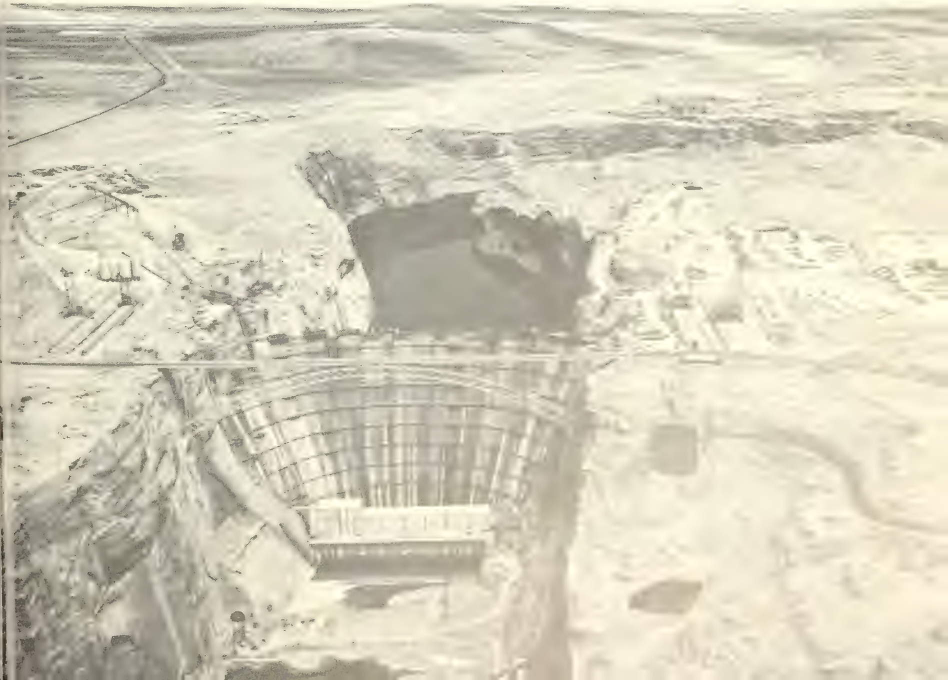
In March 1963 Lake Powell, the 28,040,000-acre-foot reservoir behind Glen Canyon Dam on the Colorado River in northern Arizona, was beginning to fill. By the end of June more than 2 million acre-feet of water had been impounded in what will be the second largest manmade lake in the United States.

The principal storage feature of the Colorado River Storage Project, concrete-arch Glen Canyon Dam, is to be "topped out" to its full height of 710 feet early in the next fiscal year. At the end of June 1963, the concrete placement had reached close to its total volume of nearly 5 million cubic yards. Construction continued on the 900,000-kilowatt Glen Canyon Powerplant, Switchyard, and appurtenant works, as well as on the dam itself.

Another of the Colorado River Storage Project's initial four storage units, the Curecanti Unit in western Colorado, was the scene of considerable activity in 1963. Blue Mesa Dam and Powerplant, first major features to be undertaken on the unit, were



Beginning of work at Glen Canyon damsite, Arizona, in November 1957 can be seen in the above upstream view of the Colorado River. The aerial view of the damsite below in May 1963 shows the dam, powerplant and other works close to completion. Nearly 2 million acre-feet of water have been stored as Lake Powell starts to fill behind the dam.



about 40 percent completed by the end of the fiscal year, comfortably ahead of schedule. The earthfill dam will be 340 feet high, with a volume of 3 million cubic yards, and the powerplant will house two 30,000-kilowatt generating units.

Work started in May on the Morrow Point Dam and Powerplant, landmark structures in the application of modern concepts and design by the Bureau of Reclamation. They incorporate three "firsts" for the Bureau: a thin-arch, doubled curvature concrete dam, only 12 feet thick at the top and 52 feet thick at the base; a free-fall, orifice-type spillway, which will allow water to fall from four openings in the top central part of the dam to a stilling pool more than 350 feet below; and the location of the 120,000-kilowatt powerplant underground in an arched-roof cavern in the canyon wall, rather than at the toe of the dam.

Further progress on the Colorado River Storage Project was noted during the year by considerable advancement of the project's Transmission Division which embraces more than a thousand miles of high-voltage transmission lines to be interconnected in an extensive power grid, transmitting power from the project's powerplants to farflung areas throughout the Upper Colorado River Basin States.

Construction of the participating projects of the Colorado River Storage Project was highlighted by completion in October 1962 of the 160-foot-high, 855,000-cubic-yard, earthfill Crawford Dam on the Smith Fork Project, followed by completion in December, 1962 of the Smith Fork Diversion Dam, Feeder Canal, Aspen Canal, and Clipper Canal.

Material progress was made on four other participating projects of the storage project—Forida in Colorado, Seedskadee in Wyoming, Hammond in New Mexico, and Central Utah in Utah. And in June 1963, groundbreaking ceremonies were held at Price, Utah, signaling beginning of construction on Joes Valley Dam, the first major feature to be undertaken on an additional participating feature, the Emery County Project. The earthfill dam will be about 195 feet high and have a volume of 1,200,000 cubic yards.

Irrigation water was delivered on Paonia and Smith Fork, the Vernal Unit of Central Utah, and Hammond projects.

In western Colorado, the Bonham and Cottonwood pipelines on the Collbran Project were completed in October 1962, thus providing water for testing and operation of the Upper Molina Powerplant (8,640 kilowatts) and Lower Molina Powerplant (4,860 kilowatts). Both plants were placed in commercial operation

This aerial view shows the Bureau of Reclamation's newly constructed service canal carrying supplemental irrigation water from Steinaker Dam to fertile farmlands of the Vernal Unit, Central Utah Project.

December 15, 1962. Also completed on the project were the East Fork Diversion Dam, East Fork Feeder Canal, and the rehabilitation of the Bonham Dam.

## Pacific Northwest Work Advances

Reclamation construction in the Pacific Northwest advanced with completion during the fiscal year of all work on the river and booster pumping plants, the 2.4-mile discharge pipeline, reservoirs, relift pumping plants, and lateral system for the East Unit, Greater Wenatchee Division of the Chief Joseph Dam Project in Washington. On the Howard Flat Unit, similar work on a smaller scale was essentially completed, and some minor work was in progress at year's end on the Brays Landing Unit.

On the Columbia Basin Project, also in the State of Washington, extension of irrigation facilities brought to a total 458,000 acres available for irrigation.

Construction on the Vale Project in Oregon was distinguished by completion in one-half the allotted contract time of Bully Creek Dam and Feeder Canal. This resulted in storage for irrigation and in material flood control benefits 1 year earlier than would have been the case had the full performance period been utilized. Bully Creek Dam is an earthfill structure 104 feet high and has a volume of 1,025,000 cubic yards.

Construction of the Mill Creek Pumping Plant, discharge line, and regulating reservoir A on The Dalles Project began in December 1962 and had reached about 60 percent completion by the end of June 1963—in 26 percent of the allotted contract time.

## Utah Construction Progresses

Accelerated construction also marked progress at the Willard Dam on Weber Basin Project in Utah. The second-stage construction completed in August 1962, the third and final stage of building the earthfill dam started immediately. By June 1963, the contract was about 60 percent completed in 39 percent of the scheduled time. The dam will have a total volume of 13 million cubic yards and will be more than 14 miles long.

A section of Willard Canal, Willard Pumping Plants Nos. 1 and 2, and the intake channel were completed in June 1963, and considerable additional progress was accomplished on other structures of the Weber Basin Project water system. Work on the Causey Dam, about 30 percent completed by the end of the fiscal year, had been concentrated on excavation and placing of concrete lining for the outlet works tunnel in preparation for diversion expected in July 1963. This dam will be an earthfill structure 200 feet high and will have a volume of 1,400,000 cubic yards. The project's Ogden Valley Diversion Dam was started in December 1962 and was about 15 percent completed by the end of June 1963.

## Texas Dam Completed

An auspicious construction event in Texas was the completion in February 1963 of the 134-foot-high, 21-million-cubic-yard, earthfill Twin Buttes Dam on the San Angelo Project. Also completed were the San Angelo Main Canal and San Angelo Distribution System.

Additional progress of Reclamation development in Texas was evident in November 1962, when the flow of the Canadian River was diverted into its prepared channel at the site of earthfill Sanford Dam on the Canadian River Project, thus releasing all the remaining flood-plain area for foundation work. By the end of June 1963, more than 6 million cubic yards of the 228-foot-high, 14,800,000-cubic-yard embankment had been placed, concrete lining of the river outlet works tunnel was about half completed, and some concrete had been placed in the flood-control outlet works. By the end of the fiscal year, work on the dam was about 40 percent completed.

Another "new start" in the Reclamation program was made when construction began on the first 56 miles of what will be, by far, the Bureau's longest aqueduct. Three hundred and twenty-two miles long, the main aqueduct of the Canadian River Project will carry water for municipal and industrial use from Sanford Dam to 11 cities in northwest Texas, underscoring a phase of Reclamation which becomes increasingly important year by year through rapid urbanization of the West.

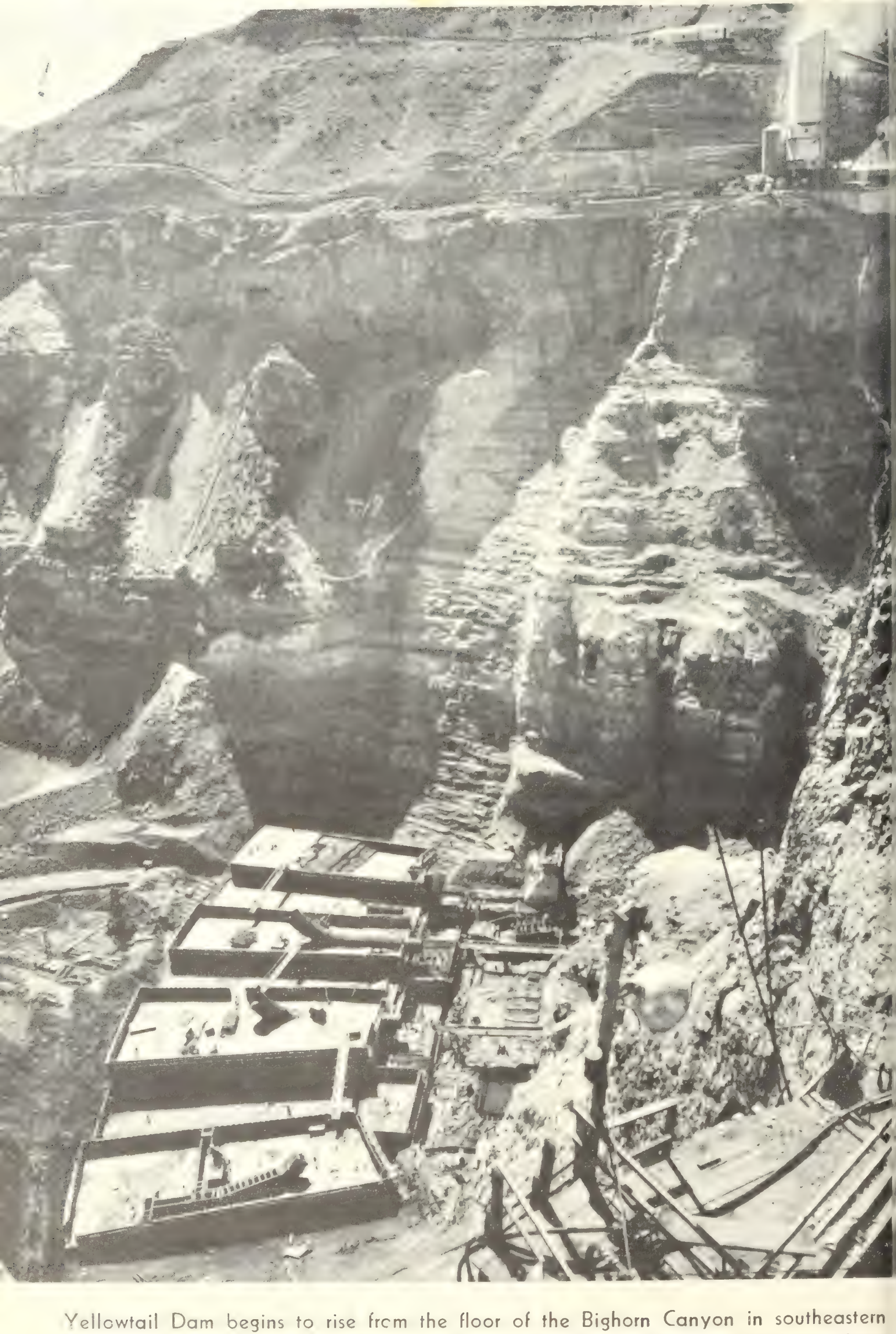
## Norman Dam Starts in Oklahoma

In Oklahoma, on the Washita Basin Project, construction of Foss Pumping Plants Nos. 1, 2, and 3 was completed in November 1962. In the same State, construction of Norman Dam on the Norman Project began in August 1962, and was about 25 percent completed by the end of June 1963. The earthfill dam will be 101 feet high and will have a volume of 2,673,000 cubic yards. Construction of 29 miles of pipelines to deliver municipal and industrial water from Norman Dam to three communities adjacent to Oklahoma City was started late in the fiscal year.

## Missouri Basin Jobs Underway

On the Missouri River Basin Project in Montana, work began on Yellowtail Dam. The Bighorn River, which the dam will control, was diverted around the site in January. On March 15, the first concrete was placed for what will be a 520-foot-high, 1,460,000-cubic-yard dam. The contract for construction of the arch dam and the 250,000-kilowatt Yellowtail Powerplant was about 35 percent completed at the end of the fiscal year.

On the East Bench Unit of the Missouri River Basin Project, also in Montana, construction of the 158-foot-high, 1,845,000-cubic-yard, earthfill Clark Canyon Dam advanced following diversion of the river through the partly completed outlet works in February 1963. By the end of June, about 40 percent of the embankment was in place. The unit's Barretts Diversion Dam was completed in January 1963, and construction of the first section of the East Bench Canal and Laterals was about 95 percent com-



Yellowtail Dam begins to rise from the floor of the Bighorn Canyon in southeastern Montana. At the end of the fiscal year the average height of the structure was about 65 feet; when completed it will be 520 feet high.

pleted by the end of June. The second section of East Bench Canal and Laterals reached about 65 percent completion by the end of the fiscal year, and the third section was started in April 1963.

On the Frenchman-Cambridge Division of the Missouri River Basin Project in Nebraska, the Red Willow Creek Diversion Dam and Red Willow Canal settling basin were completed in March, and the first section of the Red Willow Canal and Lateral System was completed 2 months later. Construction of the second section started in May 1963.

On the Farwell Unit, the Sherman Feeder Canal was substantially completed in November 1962, at which time the first water from the Arcadia Diversion Dam was fed through the canal to begin filling Sherman Reservoir. The first section of the Farwell Main Canal and Farwell Central Canal and Laterals was completed in April 1963, and work continued on other sections of canals and laterals on the unit.

TABLE 1.—*Major Bureau of Reclamation contracts awarded in fiscal year 1963*

| Feature | Project | Amount of award |
|---|---|---|
| San Luis Dam and Pumping-Generating Plant and Forebay Dam. | Central Valley | $85, 926, 608 |
| 16 miles of San Luis Canal | do | 16, 493, 785 |
| Morrow Point Dam and Powerplant | Colorado River Storage | 15, 436, 066 |
| 6 miles of main aqueduct | Canadian River | 11, 927, 550 |
| Norton Dam | Missouri River Basin | 5, 579, 026 |
| Constructing foundations and furnishing and erecting steel towers for 146 miles of Fort Thompson-Sioux Falls 230-kv transmission line. | do | 4, 253, 200 |
| oes Valley Dam | Emery County | 3, 562, 260 |
| pump-turbines for San Luis Pumping-Generating Plant. | Central Valley | 3, 221, 813 |
| .16 miles of Willard Canal | Weber Basin | 3, 173, 328 |
| 9 miles of Norman, Midwest City, and Del City pipelines. | Norman | 2, 759, 547 |
| Multichannel microwave radio system | Colorado River Storage | 2, 278, 364 |
| ost Creek Dam | Weber Basin | 2, 053, 000 |
| pumps for Mile 18 Pumping Plant | Central Valley | 1, 950, 000 |
| 3.6 miles of Farwell South Canal and 38 miles of laterals. | Missouri River Basin | 1, 931, 466 |
| 7 miles of East Bench Canal and laterals | do | 1, 731, 365 |
| 4 miles of Ainsworth Canal Section 3 | do | 1, 702, 428 |
| 1 miles of Archer-Stegall 230-kv transmission line | do | 1, 702, 384 |
| ayden Substation | Colorado River Storage | 1, 571, 000 |
| tringing conductors and overhead ground wires for 160 miles of Dawson County-Custer Section of Yellowtail-Dawson County 230-kv transmission line. | Missouri River Basin | 1, 534, 920 |
| 4 miles of Ainsworth Laterals Section 1, wasteways and 5 miles of drains. | do | [illegible] |
| ontenelle Powerplant and Switchyard | Seedskadee | [illegible] |
| 4.8 miles of Eltopia Branch Canal and Block 17 laterals, wasteways, and drain. | Columbia Basin | 1, 292, 259 |
| 6 miles of pipelines, and reservoirs and pumping plants for Brays Landing Unit Lateral System. | Chief Joseph Dam | 1, 252, 244 |
| 3 miles of Farwell Central Canal, laterals, wasteway, and drains. | Missouri River Basin | [illegible] |
| urecanti Substation, Stage 01 | Colorado River Storage | [illegible] |
| .5 miles of Red Willow Canal, laterals and drains | Missouri River Basin | [illegible] |
| hydraulic turbines for Yellowtail Powerplant | do | [illegible] |
| 345-kv power transformers for Glen Cayon Powerplant. | Colorado River Storage | [illegible] |

Construction of Merritt Dam on the Ainsworth Unit in Nebraska was about 70 percent complete by the end of June 1963. This earthfill structure will be 140 feet high and contain 1,500,000 cubic yards.

Norton Dam on the Almena Unit in Kansas was started in October 1962 and the work was about 15 percent complete by the end of June 1963. The earthfill dam will have a height of 167 feet and a volume of about 3,600,000 cubic yards.

On the project's Cedar Bluff Unit, construction of the third and final section of the Cedar Bluff Canal and Cedar Bluff Laterals was essentially completed by year's end; completed portions were placed in service immediately to assist in alleviating extreme drought conditions in the area.

Considerable progress was made during the year in construction of high-voltage transmission lines, substations, and related electrical facilities of the Transmission Division of the Missouri River Basin Project. Nearly 750 miles of newly strung wires were carrying electric energy to basin customers by year's end, and construction of more than 200 miles of additional major lines had started.

TABLE 2.—*Principal features completed on Bureau of Reclamation projects in fiscal year 1963*

| Feature | Project | State |
|---|---|---|
| River and Booster Pumping Plants for East Unit, Greater Wenatchee Division Distribution System. | Chief Joseph Dam | Washington. |
| Earthwork, pipelines, and structures including 3 pumping plants and 2 regulating reservoirs for Laterals 1 through 10 and sublaterals for the East Unit Distribution System. | do | Do. |
| Earthwork, pipelines, storage reservoir, Relift and North and South Booster Pumping Plants, discharge line and sublaterals for Howard Flat Unit. | do | Do. |
| Earthwork and structures for Block 23 laterals and wasteways, Wahluke Branch Canal laterals. | Columbia Basin | Do. |
| Bully Creek Dam and Feeder Canal | Vale | Oregon. |
| Earthwork, pipelines, and structures, and 3 reservoirs for El Dorado Main and laterals. | Central Valley | California. |
| Earthwork, pipeline, structures, and 6 reservoirs for Diamond Springs Main, Feeder Line, and laterals for El Dorado Distribution System | do | Do. |
| Earthwork, pipelines, and structures for El Dorado Main and laterals, and laterals for Diamond Springs Main, El Dorado Distribution System. | do | Do. |
| Earthwork, structures, and concrete pipelines for Madera Distribution System Part 3 extension. | do | Do. |
| Spring Creek power conduit, Tunnels Nos. 1 and 2 and Rock Creek siphon. | do | Do. |
| Construction of Spring Creek Powerplant (structure) | do | Do. |
| Construction of Lewiston Dam | do | Do. |
| Earthwork, structures, and surfacing for Trinity County Road, Trinity Dam to Buckeye Creek. | do | Do. |
| Construction of 26 miles of Trinity-Clear Creek, Clear Creek-Keswick, and Spring Creek-Keswick 230-kv transmission line. | do | Do. |
| Construction of 22 miles of Keswick-Gas Point Road-Cottonwood 230-kv transmission line. | do | Do. |
| Clearing 3,240 acres of Whiskeytown Reservoir site | do | Do. |
| Construction of Clear Creek Powerplant (structure) | do | Do. |
| Earthwork, structures, and surfacing for relocation of 2.2 miles of Shasta County Brandy Creek road. | do | Do. |
| Prosser Creek Dam | Washoe | Nevada-California. |

TABLE 2.—*Principal features completed on Bureau of Reclamation projects in fiscal year 1963*—Continued

| Feature | Project | State |
|---|---|---|
| Earthwork and structures for Steinaker Service Canal | Central Utah | Utah. |
| Earthwork, pipelines, and structures for Bonham and Cottonwood pipelines. | Collbran | Colorado. |
| Completion of Upper and Lower Molina Powerplants and Switchyards. | do | Do. |
| Earthwork and structures for East Fork Diversion Dam and East Fork Feeder Canal and rehabilitation of Bonham Dam. | do | Do. |
| Navajo Dam and access roads | Colorado River Storage. | New Mexico. |
| Laying track and ballasting for relocation of 11.65 miles of D&RGW Railroad for Navajo Dam and Reservoir. | do | Do. |
| Construction of 85.2 miles of Flaming Gorge-Vernal-Rangely 138-kv transmission line. | do | Utah-Colorado. |
| Construction of 115 miles of Rangely-Oak Creek and 10 miles of Kremmling-Green Mountain 115-kv transmission line and 8.3 miles of Kremmling-Gore Tap 69-kv transmission line. | do | Colorado. |
| Construction of 22.5 miles of Blue Mesa-Gunnison 115-kv transmission line. | do | Do. |
| Construction of 39.17 miles of Blue Mesa-Curecanti, Morrow Point-Curecanti, and Curecanti-Montrose 115-kv transmission line. | do | Do. |
| Earthwork, concrete lining, and structures for San Angelo Distribution System. | San Angelo | Texas. |
| Construction of Foss Pumping Plants Nos. 1, 2, and 3 | Washita Basin | Oklahoma. |
| Stringing conductors and overhead ground wires for 138 miles of Garrison-Jamestown 230-kv transmission line. | Missouri River Basin. | North Dakota. |
| Construction of 213 miles of Sioux City-Spencer and Sioux City-Denison-Creston 161-kv transmission line. | do | South Dakota. |
| Stringing conductors and overhead ground wire for 58 miles of Oahe-Fort Thompson 230-kv transmission line, 230-kv switchyard approaches, and 1.42 miles of 115-kv Oahe-Midland transmission line. | do | Do. |
| Construction of 88 miles of Rapid City-Newell-Maurine 115-kv transmission line. | do | Do. |
| Construction of 75 miles of Oahe-Eagle Butte 115-kv transmission line. | do | Do. |
| Construction of 65 miles of Eagle Butte-Maurine 115-kv transmission line. | do | Do. |
| Construction of 95 miles of Winner-Mission-Martin 115-kv transmission line. | do | Do. |
| Earthwork and structures for Florida Farmers Ditch Diversion Dam and ditch enlargement, and enlargement of Florida Canal. | Florida | Colorado. |
| Earthwork and structures for Main Canal, and laterals and gravity extension East Highline and West Highline laterals. | Hammond | New Mexico. |
| Crawford Dam | Smith Fork | Colorado. |
| Earthwork and structures for Smith Fork Diversion Dam, Smith Fork Feeder Canal, Aspen Canal, and Clipper Canal. | do | Do. |
| Construction of M and D Diversion Dam | Uncompahgre | Do. |
| Construction of second stage of Willard Dam | Weber Basin | Utah. |
| Earthwork and structures for Willard Canal, Willard Pumping Plants Nos. 1 and 2, and intake channel. | do | Do. |
| Earthwork and pipelines for North Davis laterals, Unit 2B, Davis Aqueduct lateral system. | do | Do. |
| Earthwork, pipelines, and structures for Woods Cross lateral system | do | Do. |
| Twin Buttes Dam | San Angelo | Texas. |
| Earthwork, concrete lining, and structures for main canal | do | Do. |
| Earthwork and structures for Red Willow Canal and laterals and drains. | Missouri River Basin | Nebraska. |
| Construction of Red Willow Creek Diversion Dam and Red Willow Canal and settling basin | do | Do. |
| Arcadia Diversion Dam and Sherman Feeder Canal | do | Do. |
| Earthwork and structures for Sherman Feeder Canal | do | Do. |
| Earthwork and structures for Sherman Feeder Canal, including tunnel. | do | Do. |
| Earthwork and structures for Farwell Main Canal, Farwell Central Canal, and laterals, wasteways, and drains. | do | Do. |
| Earthwork, concrete lining, and structures for Section No. 1 of Ainsworth Canal. | do | Do. |
| Earthwork and structures, Cedar Bluff Canal, Second Section. | do | [illegible] |

# PROJECT DEVELOPMENT

The Bureau's project development program involves preparation of plans for developing river basin resources and investigating and planning potential projects to meet requirements of the fast-growing population of the West for optimum utilization and conservation of its limited water resources. It also includes detailed preconstruction studies on newly authorized projects.

## Seven Projects Authorized

During fiscal 1963, Congress authorized seven Federal Reclamation projects: Fryingpan-Arkansas in Colorado, Mann Creek in Idaho, Arbuckle in Oklahoma, Spokane Valley in Washington (amendatory authorization), Upper Division of the Baker Project in Oregon, Agate Dam and Reservoir of the Rogue River Basin Project in Oregon, and Oroville-Tonasket Unit of the Okanogan-Similkameen Division of the Chief Joseph Dam Project in Washington.

In addition, the Crater-Long Lakes Division of the Snettisham Project in Alaska was authorized by the Flood Control Act of 1962 for construction by the U.S. Army Corps of Engineers, with operation and maintenance and power marketing assigned to the Bureau of Reclamation.

## Basin Surveys Underway

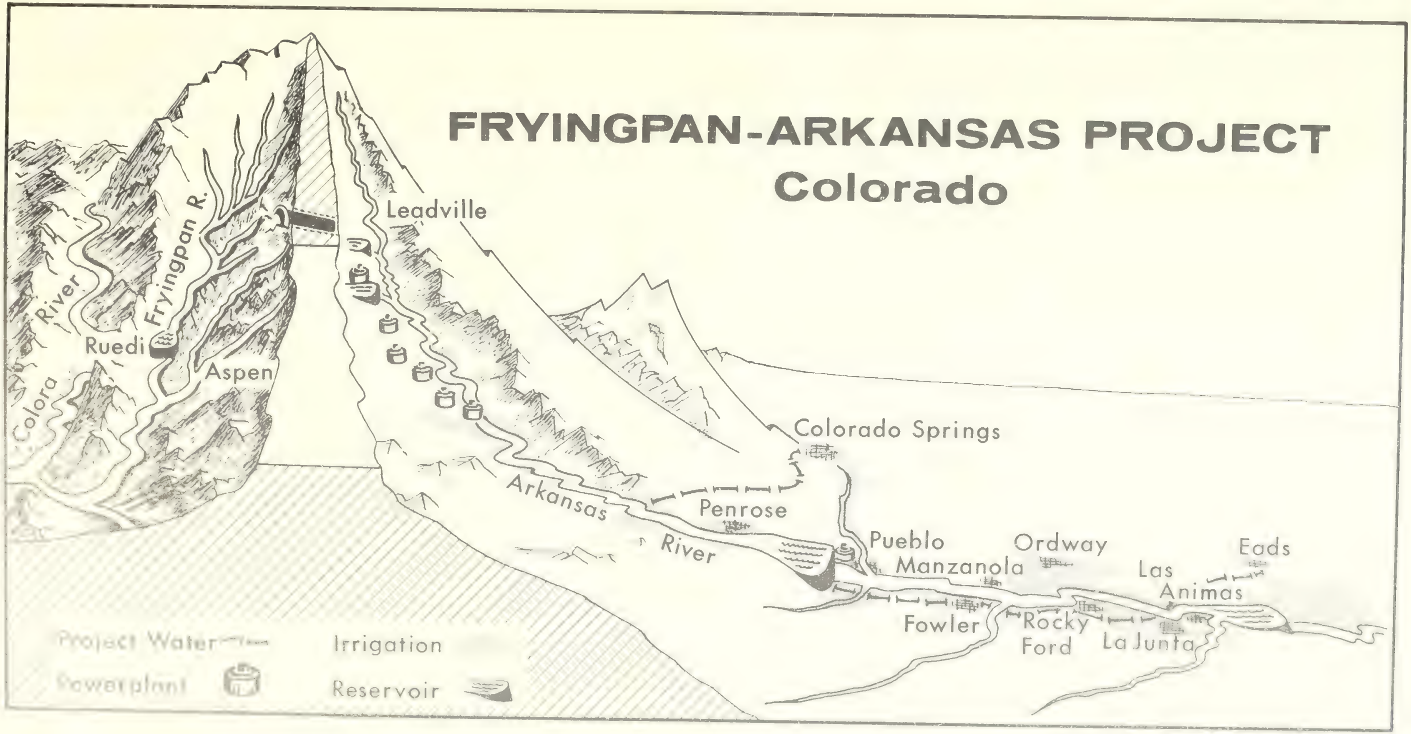
The Bureau was conducting surveys during 1963 in 17 river basins throughout the West, including 5 subbasins of the Missouri River Basin. The report on the Yellowstone Division of the Missouri River Basin Project was completed.

## Project Planning Reports Sent To Congress

Project planning reports were submitted to Congress during the year on: the Middle Gila River Project in Arizona; Bostwick Park Project in Colorado; Fruitland Mesa Project in Colorado; the Dixie Project in Utah; and the North Loup Division of the Missouri River Basin Project in Nebraska.

The Secretary's supplemental report and certification of economic justification on the Crystal Dam and Reservoir of the Curecanti Unit, Colorado River Storage Project in Colorado, was transmitted to the President and to Congress. Planning reports on the Whitestone Coulee Unit of the Chief Joseph Dam Project in Washington, and on the Merlin Division of the Rogue River

# FRYINGPAN-ARKANSAS PROJECT
## Colorado



Basin Project in Oregon, were sent the Bureau of the Budget for advice as to their relationship to the President's program prior to submission to the Congress.

Reports of planning on the Lower Teton Division of the Teton Basins Project in Idaho, the Auburn-Folsom South Unit of the Central Valley Project in California, and the Animas-La Plata Project in Colorado-New Mexico were under review by the affected States and interested Federal agencies before submittal to the Bureau of the Budget.

### Definite Plan Reports Written

Definite plan reports for authorized projects were completed on the Chestnut Valley Unit, Missouri River Basin Project in Montana; the Lyman Project in Wyoming; the Western Division of The Dalles Project in Oregon; and Cow Creek Unit of the Trinity River Division of Central Valley Project, California.

### Alaska Projects Studied

Review was completed by interested Federal agencies and Alaska on the planning report for the Devil Canyon Project. Cooperative activities with Corps of Engineers on Rampart Project were started.

### Loan Program Active

The loan program continued very active. During the year, three Small Reclamation projects and one distribution system were completed with total loans of $2,004,000; construction was initiated on five Small Projects and two distribution systems with total loans of $54,819,000; seven Small Project loans were approved totaling $10,912,000; and pending were three Small Project applications and one distribution system application, requesting loans of $4,211,000.

From the start of the program to June 30, 1963, Small Project loans totaling $68,088,000 and distribution system loans totaling $72,072,000 have been approved by the Secretary of the Interior

### River Compacts Formulated

A form of contract for the Columbia River Basin Compact, approved in 1960 by the Compact commissioners of the several basin States, was agreed upon in October 1962 by all State-appointed negotiating commissioners. The compact has been ratified by Montana, Idaho, Wyoming, and Utah; however, the Washington

Drillers sink the first core drill bit into the earth at Ruedi Damsite on the newly authorized Frying Pan-Arkansas Project, Colo.

and Oregon Legislatures did not act on bills introduced for this purpose at their sessions, and no action was initiated in Nevada.

The California-Nevada Interstate Compact Commission arrived at a tentative allocation of the waters of the Lake Tahoe Basin.

The Engineering Advisory Committee's report for the Arkansas River Compact between Kansas and Oklahoma was completed and a draft of the compact was under consideration at year's end.

The Upper Niobrara River Compact between the States of Wyoming and Nebraska was ratified by both States and was awaiting consent action by Congress.

The Lower Niobrara and Ponca Creek Compact between the States of Nebraska and South Dakota was ratified by both States and was awaiting consent action by Congress.

When called upon, the Bureau continued to provide technical assistance regarding negotiations on the following [illegible] interstate compacts: Arkansas River (Arkansas and Oklahoma)

Cheyenne River (Wyoming and South Dakota); Little Missouri River (Wyoming, Montana, and North Dakota); Red River (Arkansas, Louisiana, Oklahoma, and Texas); Truckee-Carson-Walker Rivers and Lake Tahoe (California and Nevada); and Big Blue River (Kansas and Nebraska).

## Hydrology Studies Progress

The Hydrology Branch has continued its specialized studies of proposed water-resource development projects. These studies included, but were not limited to, evaluation of the quantity and quality of water supply in relation to the multiple-purpose requirements, determination of the amount of sediment load and its deposition, and potential flood magnitudes and frequencies as the basis of design.

Study of flood hydrology problems associated with proposed Reclamation projects was continued by preparing design storm studies, reviewing the inflow design flood and frequency studies prepared in the regions, and, at the request of the regions, preparing additional inflow design flood and frequency studies.

As a part of this program, a study was made of the seasonal variation in design flood potential for the Crooked River Basin above Prineville Dam in Oregon to establish a revised seasonal requirement for flood-control space reservation. Also, revised studies of flood potential were made for several old Bureau dams to assist the Division of Design in evaluating the need for rehabilitation or proposed modifications.

Recent large flood events were studied in detail to verify or suggest changes to existing design storm and design flood criteria.

During the year the Project Development Division of the Bureau reported on the study of various sedimentation phases, including the unit weight of deposited sediments, stable channels, sediment transport, distribution of sediment in a reservoir, unit sediment yield rates, and sediment excluder devices.

Studies also were started on the determination of degradation rates below a dam and the delta buildup pattern above a reservoir. An electronic computer was used extensively to reveal total sediment loads by the Modified Einstein Procedure and to compute water surface profiles for both tailwater and backwater conditions.

Cooperative studies continued with the Geological Survey on the measurement of water use by phreatophytes in the Yuma and Buckeye areas of Arizona. The construction of evapotranspirometers was expanded during the year to include those for measuring evaporation from bare soil. The Bureau constructed evapotranspirometers in the Bernardo area of New Mexico to measure water use by phreatophytes and to develop methods for estimating the water which can be salvaged by eradication or control of the phreatophytes.

## International Streams Investigations Undertaken

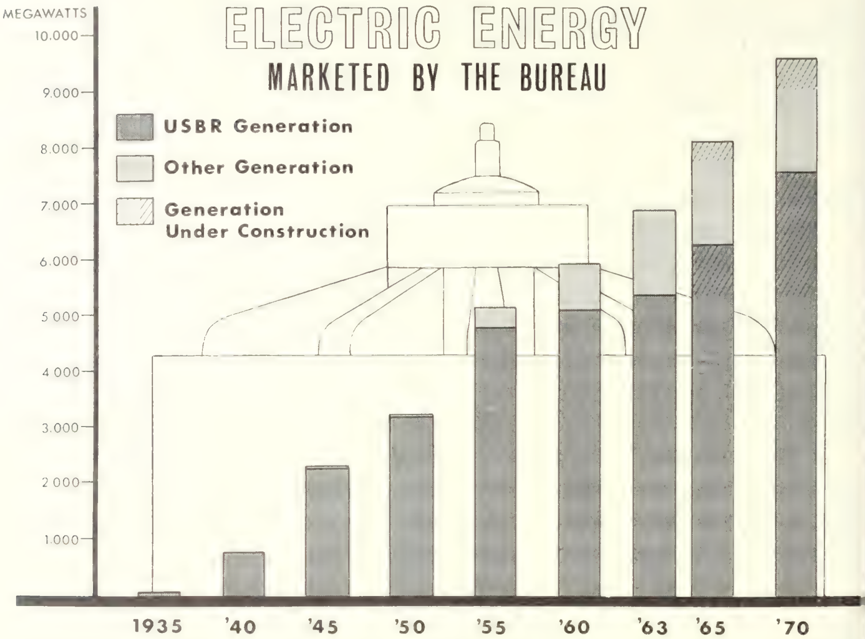
The Bureal of Reclamation was represented on three International Engineering Boards of the International Joint Commission. Under the Reference of January 12, 1948, the Souris-Red Rivers Engineering Board continued the systematic collection and study of hydrologic data and related flood control and irrigation investigations in the Souris, Red, and Missouri River Basins.

Pursuant to the Reference of April 3, 1962, the International Pembina River Engineering Board continued investigation of possible ways to develop the water resources of the Pembina River in the State of North Dakota and the Province of Manitoba.

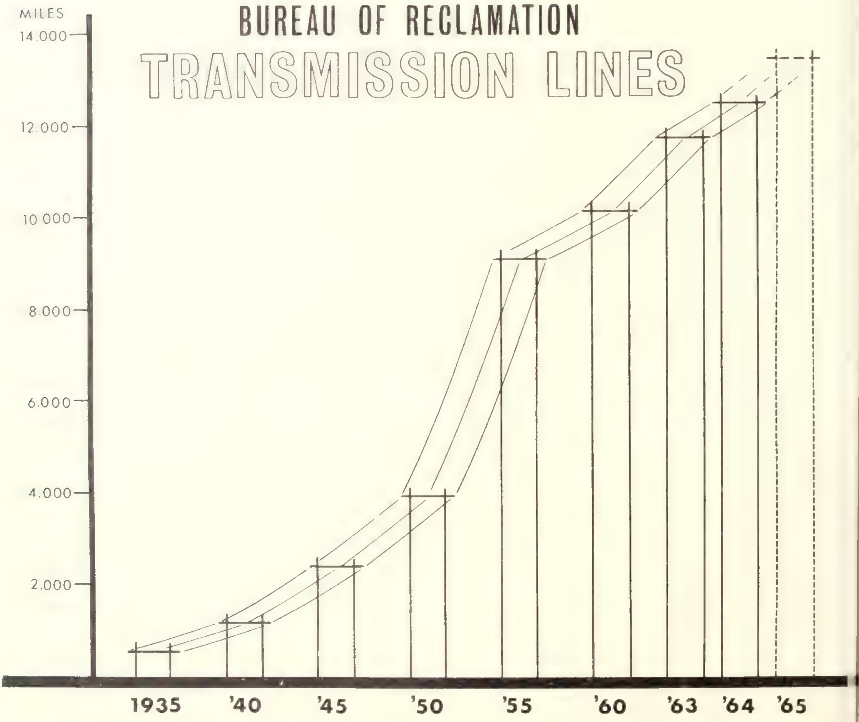
# HYDROELECTRIC POWER DEVELOPMENT

As of June 30, 1963, the Bureau of Reclamation had constructed and was operating 44 hydroelectric powerplants with an installed nameplate capacity of 5,373,450 kilowatts. This was an increase of 78,900 kilowatts over the 1962 figure. In addition, the Bureau was responsible for marketing the power generated at five U.S. Army Corps of Engineers' powerplants with an installed nameplate capacity of 1,580,035 kilowatts, an increase of 510,000 kilowatts over the 1962 figure, and for marketing the output of the Falcon powerplant, constructed by the International Boundary and Water Commission, with a nameplate capacity of 31,500 kilowatts.

Completion of the Collbran Project added 13,500 kilowatts and the first unit of the Clear Creek powerplant added 67,000 kilowatts to the Bureau's generating facilities. Siphon Drop, with an installed nameplate capacity of 1,600 kilowatts, was turned over to the Yuma County Water Users' Association for operation. (The organization also took over the Yuma Main Canal and other facilities of the Yuma Project.) The Oahe powerplant installations resulted in the Corps of Engineers' generating capacity increases.



ELECTRIC ENERGY
MARKETED BY THE BUREAU



BUREAU OF RECLAMATION
TRANSMISSION LINES

At year's end, Bureau power was being delivered to customers over 12,161 circuit-miles of transmission lines, including the 1,079 miles of high-voltage lines constructed during the preceding 12-month period.

The installed transformer capacity of the 318 individual substations being operated by the Bureau on June 30, 1963, was 12,433,724 kilovolt-amperes. This was a reduction of 2 substations and an increase of installed capacity of 852,136 kilovolt-amperes since June 30, 1962.

Sales of electric power by the Bureau during the fiscal year aggregated 28,165,095,456 kilowatt-hours, an increase of 5.4 percent over 1962. Revenues from these sales, plus other income realized from operation of the Bureau's power facilities, were $74,385,513, an increased of 1.0 percent over the 1962 figure.

## New Power Contracts Written

During the year, the Bureau of Reclamation executed 322 contracts, memorandums of agreement, or contract supplements for the sale of power, transmission service, or for other types of electric service. In addition to these contracts, negotiations were started with more than 150 municipalities, Government installations, and cooperatives in the Colorado River Storage Project, Missouri River Basin Project, and Central Valley Project areas, in connection with firm power allocations to be available from these projects.

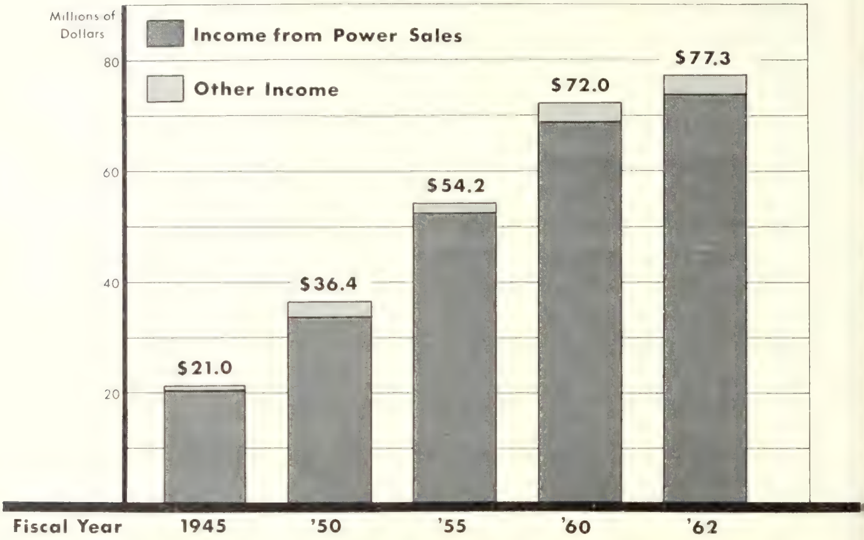
Classes and number of customers included in the 322 contracts were: municipalities, 158; REA cooperatives, 47; private utilities, 38; Federal agencies, 31; irrigation districts, 21; State agencies, 19; public utility districts, 5; non-REA cooperatives, 2; and industrial, 1.

The year saw the conclusion of several important allocations and contractual arrangements for generation and transmission, sale and purchase of power.

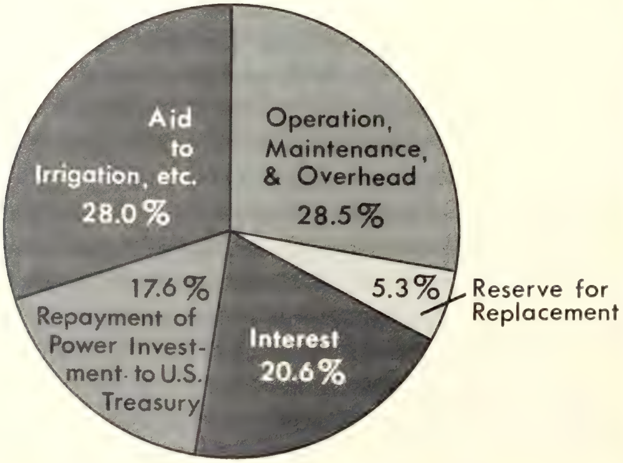
## Missouri Basin Eastern Division Pooling Starts

The Missouri Basin systems pooling agreement, which became effective January 31, 1963, provides better utilization of existing and future generating and transmission facilities of participating members. The agreement culminated work of a committee appointed in 1961 representing the Department of the Interior and preference systems. It was the first instance where the Federal Government worked out areawide arrangements with preference

## BUREAU OF RECLAMATION
## Revenue from Electric Power Operations



## Bureau of Reclamation
## GROSS POWER REVENUE DISTRIBUTIO
### (Based on Complete Payout of Projects)



customers for use of the capacity in the Federal transmission system, to deliver thermal power generated by preference customers, on an assured transmission capacity basis.

In addition to Federal agencies, there are 101 preference customers consisting of cooperatives, cities, towns, and other units in Montana, North Dakota, South Dakota, Minnesota, Iowa, and Nebraska.

Advantages of pooling transmission resources has been well established throughout the power supply field. It postpones the necessity for expenditures required for construction of additional facilities by the individual members through apportioning the responsibility for the construction program among the members. The agreement also provides for orderly planning of future generation facilities when needed, and allows the preference customers to combine their resources so as to permit installation of larger and more efficient thermal electric generating units. The United States will benefit by the installation of such thermal units, since they will provide an economical source of firming energy to combine with the output of the hydroelectric generating facilities.

## Basin Contract Written

The Bureau executed a contract November 29, 1962, with the Basin Electric Power Cooperative of North Dakota, covering the use of joint transmission system and mutual services. This contract provides for the wheeling of basin-generated power over U.S. transmission lines to basin members; the power will be produced at a steam electric generating plant to be installed by basin near Stanton, N. Dak. It also provides for the sale to the United States of surplus energy at a net cost lower than heretofore considered likely.

This contract culminates work begun by the Department a year ago to meet a critical power shortage for preference customers in the Missouri River Basin in 1965.

## Missouri River Basin Western Division Allotments Made

In connection with the contracts with preference customers in the Western Division of the Missouri River Basin Project, the Bureau on December 21, 1962, announced allotments of power for both summer and winter in the total amounts of 384.004 mw and 345.749 mw, respectively.

### Colorado River Storage Allotments Announced

The initial allotments to the Northern Division customers of the Colorado River Storage Project were made in total amounts of 627.11 mw summer and 666.50 mw winter. Tentative allotments were made to customers in the Southern Division in total amounts of 344.20 mw summer, 328.25 mw winter. The total capacity of the project is expected to be approximately 1,200 mw.

### Central Valley Project Power Starts

Additional and initial allotments of power to the Central Valley Project preference customers, made available with the advent of the Trinity Division power, were announced September 4, 1962. The initial power available from Trinity and allocated is 287.1 mw. However, it has been determined that this amount can be increased to 425 mw, bringing the total supported Central Valley power up to 875 mw capacity. Contracts with preference customers were being prepared at year's end.

## IRRIGATION, LAND AND WATER USE

The 1962 crop year established a new record in the production of high-value nonsurplus crops on irrigated lands served by Reclamation's multipurpose water resource projects in the 17 Western States. Gross farm value of all crops produced on the 7,185,736 acres, which received a full, supplemental, or temporary water supply from projects in 1962, was a record $1.22 billion, marking the fourth successive year in which the value of crops grown exceeded $1 billion.

The cumulative value of all crops produced on Federal Reclamation projects since 1906 reached $18.87 billion. This is a return from the irrigation phase alone, of almost five times the entire Federal cost of plant, property, and equipment associated with all Reclamation projects (including construction in progress) for hydropower generation, flood prevention, navigation, fish and wildlife conservation, recreation, river regulation, and other public needs in addition to irrigation.

Irrigation service from Reclamation works was available in 1962 to 8,597,346 irrigable acres, an increase of 362,665 acres over the previous year. However, 93 percent of this increase was represented by supplemental and temporary services, indicating the current stabilizing of local economies which have developed around Reclamation projects.

Full irrigation water supplies were available to 4,384,822 irrigable acres, an increase of 25,335 acres over the equivalent 1961 figure. Eighty percent of these lands, or 3,529,748 acres, was irrigated and produced crops valued at $603,665,891, an increase of $36.7 million over the previous year.

Supplemental water service was available to 3,954,409 irrigable acres, up 134,526 acres over 1961, and 3,468,319 acres were irrigated. Lands receiving supplemental service embrace those areas where regular water supplies have been found inadequate. The value of crops produced on these lands in 1962 was $563,207,353, an increase of $27,193,655 over the 1961 crop year.

Lands receiving temporary water service showed the largest increase for the year; irrigable acreage expanded by 202,804 acres to reach a total of 258,115 acres, and acreage irrigated jumped from 48,264 acres to 187,669 acres, a net increase of 139,405 acres over the previous year. Lands in this category receive water from Reclamation project facilities under temporary arrangements while contracts are pending. Nearly all the increase in temporary service lands occurred along the Friant-Kern and Delta-Mendota Canals of the Central Valley Project in California. The value of all crops produced on the temporary service lands rose to $56,065,114, or $47,708,087 over the previous year total of $8,357,027.

## New Crop Areas Added

Six new projects or units reported initial production during the 1962 irrigation season. Among these were the Collbran Project, Colorado, with 22,210 acres of irrigable area for service; Hammond Project, New Mexico, 1,316 acres; Pleasant Valley Project, California, 11,152 acres; and San Benito Project, California, 24,694 acres. The latter two projects were constructed under the authority of Public Law 984, also known as the Small Reclamation Projects Act of 1956.

Water supplies were provided also to additional acreages in 1962 on projects included in previous reports. The area for ervice of the Central Valley Project increased 268,896 acres over 961, representing primarily the firming up of water supplies for land developed under private initiative. Other increases included Columbia Basin Project, Washington, 10,334 acres; Solano Project, California, 9,962 acres; Cachuma Project, California, 8,536 acres; and Crooked River Project, Oregon, 7,140 acres.

## Vitamins and Vigor Provided for America

There were 129,682 irrigated farms on Reclamation projects in 1962, with a total farm population of 530,926.

More than 150 different kinds of irrigated crops were grown on Reclamation farms during the year. As in 1961, the high-value specialty crops made substantial gains in 1962. Despite serious weather setbacks in several Western States, vegetables, nursery and seed crops, fruits, nuts, and sugarbeets accounted for $626 million, or more than half the total value of all crops produced on Reclamation projects. The value of vegetable crops alone increased 23 percent over 1961, accounting for more than $253 million, or one-fifth the value of total crop production.

Sugarbeet acreage, which experienced an increase in the previous year of about 65,000 acres, gained only 17,257 acres in 1962, despite the present sugar shortage. While Reclamation project farmers are able and anxious to expand sugarbeet acreage to meet the Nation's sugar requirements, a lack of processing facilities seriously retards further expansion.

In response to the rapid western population and urban growth, water deliveries from Reclamation projects for municipal, industrial, and domestic purposes continue to be an ever more important phase of the Reclamation program. During 1962, a total of 474.2 billion gallons of water was delivered to 84 primary contracting entities, which in turn serve a population of 10.1 million people. The expansion of towns and cities within or adjacent to project areas in 1962 brought the total urbanized project land area to 236,450 acres, with more than a million persons now residing on these once-farmed lands.

## Operational Activities

Operation and maintenance of irrigation facilities during fiscal 1963 related to 216 storage reservoirs, 131 diversion dams, 27,810 miles of canal and lateral distribution systems, and 9,767 miles of drains and ditches.

Approximately 57 percent of the storage reservoirs and 83 percent of the water carriage and distribution facilities were operated and maintained by local entities in keeping with the continuing and longstanding policy of transferring the care, operation, and

Workers harvest lettuce on a Yuma Project farm on the lower Colorado River in the Pacific Southwest. There were 129,682 irrigated farms on Reclamation projects in 1962.

maintenance of irrigation works to local water users' organizations. During the year certain facilities on mine projects moved from the construction to operational status, and facilities on eight projects were transferred to water users' groups.

## Use of Water Increases

Every year competition for the available supply of water becomes keener, intensifying the need to make the best possible use of the Nation's precious natural resource.

For this reason, the Bureau of Reclamation has launched a program to provide a detailed evaluation of the use of water on existing irrigation projects. The results of these studies are needed to determine more precisely the optimum farm irrigation requirements, to determine optimum sizing of distribution systems and control works, and to determine measures of obtaining efficient distribution and application of water. The information thus gained will be useful in planning new projects and will assist in developing means of achieving more efficient use of water on existing projects.

Today's Reclamation projects deliver water to approximately 130,000 farms and to 84 municipal and industrial contractors, providing direct benefits to over 1,664,000 people on irrigated lands and to almost 10 million people living in municipal areas.

## DEVELOPMENT FARMS

Development farms on new irrigation projects not only demonstrate more efficient and economical irrigation practices, but also stress the value of conserving soil and water through better use of these important natural resources. In view of the Nation's burgeoning population and the decreasing areas suitable for agriculture, such conservation is considered by the Bureau to be of ever-increasing importance.

Development farms are established as far as possible in advance of settlement, usually 2 to 5 years, so newly arrived settlers will have the benefit of the experience and information gained. The major portion of each farm is devoted to field scale demonstrations of approved farm irrigation systems, irrigation methods, kinds and varieties of adapted crops, cultural practices, most effective fertilizers, weed control, farm drainage, and solutions to other problems with which new irrigation farmers are faced. From 10 to 25 percent of most of the farms is set aside for research, which is conducted by State college experiment stations and cooperating agricultural agencies such as the Agricultural Research Service and the Soil Conservation Service. Methods developed from research are thoroughly tested and demonstrated on the farms, some of which have served the additional purpose of aiding in determining the feasibility of projects.

Two development farms were established by the Bureau in fiscal 1963 in the Missouri River Basin Project, bringing the total number in operation to six. Twenty-five have been discontinued, having served their purpose. The Bureau will continue to establish these development farms on areas opened to settlement because of their proven value in helping to overcome many factors which had caused hardship and often failures of settlers on earlier projects.

The Bureau of Reclamation and other agencies responsible for the development farms work closely with the State college extension services to be certain that the information resulting from research and demonstrations is properly disseminated to the new settlers. Hundreds of farmers attend the annual field days and tours at which representatives of the Bureau and cooperating agencies explain the work in detail. The settlers are encouraged to visit the farms at any time during the year to obtain information and they are joined by college and high school students with their instructors.

## IMPORTANT DOCUMENTS APPROVED

During fiscal year 1963, the Bureau adhered to the prevailing policy of the Congress, the Department, and the Bureau itself in securing executed and validated repayment contracts for an appropriate share of the reimbursable costs of projects before initiation of construction. Recognizing that the emphasis and need for water in the West is changing, the Bureau is tailoring its repayment and water service contracts to these altered municipal and industrial requirements. It was necessary in 1963 to amend several existing contracts to provide relief to the irrigation districts from financial difficulties occasioned by unprecedented droughts, agriculture prices and production problems, disparity between farm costs and income, and such developments. Consequently, contracts were executed adopting variable repayment plans consistent with the water users' ability to pay, some construction charges were deferred or rescheduled, and, in a few instances, development periods were extended.

Two history-making documents were approved by the President in a ceremony at the White House on January 28, 1963. One was the Nation's largest water-service contract, signed with the Westlands Water District, Fresno, Calif. It covers service to nearly 400,000 acres, and revenues therefrom will be sufficient to cover the costs associated with construction of irrigation facilities and operation and maintenance of the San Luis Unit of the project and will be in excess of $1/4 billion over the 40-year term of the contract.

In the Columbia Basin Project of Washington, final agreement was reached on terms of a short-form repayment contract covering 472,000 acres of the East Columbia Basin Irrigation District. The two other irrigation districts in the basin had previously signed short-form contracts. Negotiations were toward transferring operation and maintenance of this project to the districts and to a long-form amendatory contract.

On January 28, 1963, President Kennedy approved a water service contract with Westlands Water District, San Luis Unit, Central Valley Project, Calif., and a repayment contract with East Columbia Basin Irrigation District, Columbia Basin Project, Wash.

Efforts to work out a permanent solution to the problems of the Riverton Project in Wyoming continued. As a result of studies by a board of consultants appointed by the Secretary, and on recommendations of the House Interior and Insular Affairs Committee, a Reclamation Projects Survey Team was appointed to study and analyze conditions associated with problems being experienced on all Reclamation projects in Wyoming. Consideration of the report and recommendations of the team is currently underway.

### Varied Developments Financed by Loans

A $7,150,000 rehabilitation and betterment loan to the Coachella Valley County Water District, Central Valley Project, California, was approved.

During the last month of the fiscal year the first Small Reclamation Projects Loan repayment contract to be negotiated between the United States and the State of Hawaii was executed in Washington, D.C. The $4,514,000 loan will finance completion of an irrigation project on Molokai Island, which was already under construction by our newest State.

Also during the last month of the fiscal year, contracts were executed with the Middle Rio Grande Conservancy District and the city of Albuquerque for repayment of reimbursable costs of the initial stage of the San Juan-Chama Project, New Mexico-Colorado. The district's share of the project cost is $12,401,200.

However, approximately $9 million of this is to be returned to the United States from New Mexico's share of power revenues from the Colorado River Storage Project. The contract with the city of Albuquerque provides that the city is to pay construction costs of $30,926,000. Construction of the project is scheduled to begin early in 1964, and when completed, San Juan-Chama is expected to yield about 101,800 acre-feet annually to the water-deficient areas in the Rio Grande River Basin in the vicinity of Albuquerque, N. Mex.

At the close of the fiscal year, negotiations were nearing completion with the Arbuckle Master Conservancy District for repayment of the reimbursable portion of the $13,340,000 Arbuckle Project in Oklahoma. This project will consist of a dam and reservoir and an aqueduct system, and will supply water for municipal and industrial purposes. In addition, it will provide flood control, fish and wildlife, and recreational benefits.

The value of all repayment contracts on June 30, 1963, was $1,171,470,817. Of this, $178,085,192 has been paid and delinquencies were insignificant. In addition, the outstanding repayment obligations under the Small Reclamation Projects and Distribution System Loan programs was $62,962,318.

## ENGINEERING "FIRST" ESTABLISHED

Utilizing advanced techniques of analysis, coupled with use of sophisticated methods of electronic control and communication and automatic computer procedures, Bureau designers opened up new vistas in technical development during fiscal 1963. The results were manifested in improved performance of project equipment, increased efficiency of project operation and maintenance, and substantial savings in construction, operation, and maintenance costs. Designs of project structures and facilities proceeded on schedule during the year, as evidenced by the issuance of specifications for 74 construction contracts, 84 major supply contracts, and by preparation of 4,300 new drawings and revision of more than 1,500 "as-built" drawings.

Bureau designers incorporated three Reclamation "firsts" in the power-dispatching system for the Colorado River Storage Project—first use of an on-line electronic (digital) computer for control of a power system; first application of automatic dispatch and water optimization to a power system; and first dispatch of power from an integrated system embracing both hydroelectric and thermal (steam) powerplants.

The complex dispatching facilities, which will be housed in the project's Power Operations Center at Montrose, Colo., will provide automatic tieline load frequency control for the vast interconnected power system. The digital computer will provide automatic allocation of generator loading on an economic basis with due consideration to maximum use of the project water and transmission facilities. The computer dispatching system will also automatically log kilowatt-hours, perform energy accounting, solve system problems, and determine power flows and system characteristics.

Another Reclamation design "first" was inclusion of "solid state" devices (transistors, magnetic amplifying devices, and related electronic facilities) in equipment which will remotely control the Vernal Substation of the Colorado River Storage Project in Utah from the Montrose Power Operations Center. Use of the solid-state equipment will reduce the ever-increasing costs of maintenance of supervisory control and telemetering equipment by eliminating electromechanical relays and various devices having moving parts. In addition, the equipment will provide automatic logging of system data, at periodic intervals, allowing the operators at the center time for more important duties. The solid-state supervisory control equipment will also be installed to control the project's Pinnacle Peak, Shiprock, and Curecanti Substations.

To assure maximum efficiency of service, Bureau experts incorporated in their designs of the Colorado River Storage Project a multichannel microwave radio system to serve the project's power facilities in the States of Utah, Wyoming, Colorado, Arizona and New Mexico. The microwave communication system will provide up-to-date supervision and control. Coded information and orders, embracing electrical power needs and loads throughout the extensive service area of the project, as well as in adjoining regions interconnected with Reclamation's power facilities, will flow through the microwave network connecting powerplants, substations, and power dispatch centers.

To expedite radio propagation test of the extensive radio system of the Colorado River Storage Project, Bureau engineers developed two 80-foot collapsible portable test towers. Each tower has a bracket which allows the complete assembly to be bolted to a station wagon. The towers are transported in a horizontal position and pivot on the bracket into an upright position for erection.

Since access to remote mountainous areas is thus possible with the four-wheel-drive station wagons, the towers can be erected to an 80-foot elevation in about 15 minutes, providing an efficient and rapid means of performing radio propagation tests.

Patent application was made during the year for a novel power device which utilizes the effect of the electrostatic field surrounding high-voltage transmission lines. The device, developed by a Reclamation electrical engineer, was tested on the 230-kilovolt Dawson County-Bismarck transmission line, providing a source of power for aircraft warning lights. A modified version of the device is to be installed on a transmission line near Glen Canyon Powerplant to supply power for aircraft warning lighting.

## Computer Used in Design

Increased emphasis on the application of electronic computers to engineering analyses and design problems gave additional thrust to the Bureau's program to improve designs, while lowering costs. The electronic computer in the Bureau's engineering offices in Denver was used about 300 hours a month to expedite solutions to many complex engineering and scientific problems.

As a corollary to the use of computers in design, selected staff members received special training in the use of CPM (Critical Path Method) and PERT (Program Evaluation Review Technique). These relatively new techniques facilitated planning and execution of work programs. They consist of the analytical appraisal of all work to be performed and logical determination of their timing and sequence. As the process is complex, involving many computational steps, electronic computers expedite the identifying of the "critical path" of work. To encourage expedition of construction schedules, a new provision was added to Bureau specifications to allow contractors the choice of scheduling their work by these or similar refined types of scheduling, in lieu of the usual bar-graph construction program.

## "Seeing Eye" Probes Deep

A significant technical event of the year was the use of a closed-circuit, bore-hole television telescope to investigate foundation conditions at the site of the Morrow Point Dam and Powerplant—the first application of the device to small-size drill holes in dam foundation exploration in the United States. With the TV telescope lowered in 3-inch-diameter holes at the damsite, Bureau geologists observed in-place geologic features visible in the walls of the holes, such as bedding planes, faults, and joint conditions.

The new geologic exploration device will assist in solving many foundation problems at other construction sites which formerly would have required expensive large-diameter drill holes or exploration shafts.

Another technical advancement in geologic investigations was the Bureau's first use of airborne magnetometer surveys in connection with standard surface geologic deep drill hole investigations of the 25 miles of tunnels proposed for the San Juan-Chama Project, a transmountain diversion project in New Mexico. The magnetometer profiles revealed by "high" and "lows" the probable location of igneous rock masses as contrasted with low magnetic sedimentary rocks. The results—coupled with comparative ground magnetometer surveys—will influence the determination of locating deep drill holes, and together with the drill hole data, will widen the Bureau's technical bases for sound tunnel design.

## Flexible Pumping Units Designed

In hydraulic machinery design, an outstanding event of the year was the Bureau's first design of large-size, variable-pitch pumping units. The units are to be installed in the Forebay and Mile 18 Pumping Plants on the San Luis Unit of the Central Valley Project. The technical significance of the design is that the blades of the pumps can be rotated to obtain variable water discharge, thus making possible flexibility in pumping operation for peak efficiency.

## Systems Compared for Economy

A major step forward in irrigation system design having significant bearing on conservation of water resources of the western United States was the start of a comprehensive study to determine relative annual costs of the construction and operation of pipe distribution systems as compared with open ditch distribution systems. The study embraces such factors as all annual costs inherent in each type of system, including costs of rights-of-way, maintenance, loss of water by seepage and evaporation, and difference in crop production on rights-of-way taken out of production.

In mechanical design, economies in maintenance will be achieved by the design of four large surge tanks for the main aqueduct of the Canadian River Project. The tanks, ranging up to 25 feet in diameter and 192 feet high, will have stainless-steel-clad plates for shells, obviating the need for future interior maintenance. Economies also will be realized by adopting a new-type structural steel for gates of hydraulic structures. Higher strength and improved

This artist's conception shows one of the three 345-kilovolt towers being erected on the west rim of the Canyon at Glen Canyon Dam, Ariz., believed to be the first towers in the United States to use extra high strength structural steel shapes.

welding properties of the steel will permit reduction of weights and lower fabrication costs of large gates.

Three high steel towers, of unusual proportions for electric power use, were designed for the west rim of the canyon at Glen Canyon Dam. Each tower will support a 345-kilovolt transformer circuit from the 900,000-kilowatt Glen Canyon Powerplant at the dam. The towers are believed to be the first in the United States using new extra-high-strength structural steel shapes. Two are 210 feet high and the third is 190 feet. Weight saved by the extra-high-strength steel shapes will be 50 percent where used. Weight reduction will save 20 percent.

# VARIED RESEARCH PROGRAM DEVELOPED

Research on a wide variety of investigations in new materials and improved methods for application to Reclamation projects was carried forward during the year.

Establishment of an electrical power branch in the Bureau's Division of Research in Denver, Colo., gave new dimension to studies. This unit is to solve problems originating from the unusual aspects of the Bureau's electrical power generation and transmission developments for which available apparatus and techniques are not adequate.

A mobile electrical testing laboratory was designed and placed under contract for fabrication. This laboratory, which will have facilities for a wide range of field testing and performance studies on installed electrical equipment, will be used initially for on-site testing of electrical power features on the Colorado River Storage Project. Subsequently it will be available for testing transmission lines, substations, and other equipment throughout the Reclamation West.

## Weather Modification Uses Computer

Progress was made during the year in the Bureau's weather modification research which has as its goal the increase of water supply on Reclamation projects through artificially induced precipitation. The Bureau's electronic computer accelerated reconnaissance-type correlations of historic data from several drainage basins in California; the computer technique will continue to be employed to expedite statistical methods in analysis and correlation of hydrologic and meteorological data from other areas under consideration for possible weather modification activities. Simultaneously, research continued at three universities, under contracts with the Bureau, in support of the program. At the University of Wyoming, promising results came from cloud studies; at the South Dakota School of Mines and Technology, results of artificially nucleating convective clouds were documented; and the University of Nevada, in cooperation with the Bureau, proceeded with a long-term research program on the Humboldt Project in Nevada.

## Evaporation Reduction

The objective of this major research is to develop practical techniques to reduce evaporation from reservoirs by using a 1-molecule-thick chemical layer (monolayer) to retard evaporation. Under intensive investigation during the year were chemical analyses of commercial fatty alcohols to form monolayers. The goal is the development of Federal specifications for purchasing fatty alcohols so that selected compounds will be tasteless, colorless, and wholly harmless to all life. A full-scale evaporation reduction field test will occur in 1964.

## Benefits Counted From Hydraulic Research

Several developments in hydraulic research during the year were expected to help improve performance and economy in project structures. A significant achievement was development of a method of handling free fall of spillway discharges up to 40,000 cubic feet per second at Morrow Point Dam. The enormous energy of the water falling more than 350 feet will be dissipated in a concrete-lined pool at the toe of the dam.

Operation of the Mile 18 and Forebay Pumping Plants in California will be improved by the highly efficient suction inlet developed from hydraulic models. By using carefully shaped passages and a greater degree of curvature than in the usual 90-degree tubes, better entrance and exit conditions will result in the pumping plants. Much less forebay excavation will be required.

Other advances in hydraulic research included improvement of designing large concrete-lined canals for flat slopes. Also underway during the year were studies utilizing radioisotopes to measure waterflows in large canals; studies of salinity in ground-water aquifers; testing and evaluation of small water-measuring devices aimed at developing devices that are useful, economical, and trouble free on irrigation projects; and comparative investigations of full-size and models of regulating gates for controlling flow in closed conduits.

## Sedimentation in Lake Mead Studied

The Bureau engaged the U.S. Coast and Geodetic Survey to conduct a hydrographic survey to determine the quantity of sediment deposited in Lake Mead above Hoover Dam since the first such study was completed 14 years ago. The survey, begun in May, will be particularly meaningful because of the closing of the gates at Glen Canyon Dam, which will impound in Lake Powell 75 percent of the sediment now flowing down the Colorado River.

Glen Canyon Dam can be expected to prolong the life of Lake Mead indefinitely, affording the opportunity to develop a more stable area-capacity formula for it. The actual study of sedimentation in Lake Mead will be preceded by initial investigations of crustal movement of the earth in the area due to the load imposed by the tremendous weight of the lake—over 40 billion tons when the lake is at maximum capacity.

A hydraulic engineer in the Bureau of Reclamation's research laboratories in Denver, Colo., checks the model of the new improved suction inlet tube developed for use in large pumping plants.

## New Test Devised in Soils Research

An outstanding achievement in soils research was the development of a unique laboratory test method of measuring capillary pressures (considerably below atmospheric pressure) of cohesive soils. The values of the pressures thus determined can be applied as major corrections in determining effective grain-to-grain stress which influences the strength of a cohesive soil. The advancement is expected to have significant influence on the design of earth structures of cohesive soils, with a resulting economy in construction.

Also in field soils research, instruments were installed in a moderately high embankment along a reach of the Farwell Main Canal in Nebraska to analyze the distribution and flow of canal water through the soil and to determine the effect of water on the stability of the embankment. Such analyses of soil pore-water pressures and moisture content, checking arbitrary design assumptions that had been previously adopted, are expected to cut costs in designing and constructing canal embankments.

A simple and fast method to test the cement content of freshly mixed soil-cement was developed for field use. The chemical test method is important in rock-scarce areas where soil-cement is used as slope protection for earth dams in lieu of conventional rock ripraping. The method is to be used in fiscal 1964 as a field control measure during construction of soil-cement facing on Merritt Dam in Nebraska.

Under development during the fiscal year were laboratory equipment and test procedures to simulate effects of earthquakes on laboratory soil specimens. The tests, in conjunction with standard soil tests to determine soil-strength characteristics, are significant because the effects of earthquakes can be included as part of the complete evaluation of soils for use in earth structures.

## Concrete Studies Cut Costs

Research in concrete construction will reduce costs of placing mass concrete for Morrow Point Dam. Investigations to determine the influence of maximum-size aggregate (stones and cobbles) on compressive strength of concrete indicated that it may be more economical to use smaller size aggregates, depending on the compressive strength desired. As a result of these investigations and because concrete with smaller cobbles is easier to handle and has better workability, it was possible to reduce the maximum aggregate size from the usual 6 inches to 4½ inches for the concrete in the dam, thus cutting handling and placing costs.

Significant economies in concrete pipe construction are expected to be attained from research conducted during the year on the distribution of soil pressures around concrete pipe.

Other research in concrete in 1963 included measurement of progressive deterioration of concrete subjected to repeated cycles of freezing and thawing, utilizing ultrasonic testing techniques;

testing of epoxy, neoprene, and sprayed polyester coatings for possible use in protecting concrete surfaces from damage caused by erosion of sediment carried in high-velocity water, by freezing and thawing, and by other forces; investigations of admixtures to improve the overall quality of concrete; field research in determining the frictional resistance values of a large concrete-lined tunnel; and aerodynamic studies to provide a design criterion for more accurate prediction of resistance of concrete surfaces to fluid flow.

## TECHNICAL REPORTS ISSUED

Published during the year were the technical records on the design and construction of the earthfill Prineville Dam, the thin-arch, concrete Anchor Dam, and the 48,000-kilowatt Fremont Canyon Powerplant and the 3-mile-long power conduit. The comprehensive book, "Linings for Irrigation Canals," describing the Bureau's technical advances in developing and utilizing lower cost materials and methods for lining canals conveying irrigation water to irrigable lands, was completed and was scheduled for publication early in fiscal 1964. Also issued were an engineering monograph on stress analysis of hydraulic turbine parts and more than 270 laboratory reports on research activities.

Requests for the Bureau's publications and informational materials increased 13 percent, as indicated by the 7,300 requests received from individuals in this country and in foreign countries. More than 36,000 copies of technical publications and informational pamphlets were sold or distributed. About half of the sales were to foreign countries.

A western distribution center was established in Denver to facilitate distribution of motion picture films on Bureau engineering accomplishments in water resource development. By year's end, more than 2,200 prints of films were made available for showing before a wide audience in the western half of the United States.

### Weed and Seepage Control Progresses

The comprehensive weed-control program of the Bureau of Reclamation proved effective during 1963 in reducing problems caused by various types of undesirable vegetation. Operation and maintenance costs caused by weeds have been decreased, and the program is aiding materially in reducing water losses resulting from transpiration, evaporation, and seepage.

More efficient and economical methods of controlling weeds infesting banks and channels of irrigation and drainage systems are being developed through research conducted in cooperation with the U.S. Department of Agriculture. This phase of the program is being accomplished at four field stations in the West, and in the Chief Engineer's weed-control laboratory in Denver.

From a recent survey the Bureau estimated nearly 2 million acre-feet of water is lost each year due to weeds on irrigation systems in the 17 Western States. It was similarly estimated that the total costs and losses caused by these weeds were about $5¾ million. The relatively small investment in research and education in weed control has prevented an additional $15.8 million in costs and losses. While the research program is being continued, more studies are needed to aid in solving this major irrigation problem.

## Water Thievery by Plants Fought

The year saw some progress in developing more effective methods for controlling woody phreatophytes, including saltcedar, where they have invaded irrigation systems, natural water courses, reservoirs, and other areas. These growths usurp millions of acre-feet of water greatly needed for irrigation, municipal, and industrial purposes, and they also increase flood hazards and take over lands needed for grazing and agriculture. The Bureau estimates that in the 17 Western States, undesirable phreatophytes infest over 15 million acres and steal from useful purpose at least 25 million acre-feet of water annually, nearly enough to fill Lake Mead every 12 months. Department of Agriculture and the Department of the Interior committees are working on this and other weed-control problems common to Government agencies.

Special studies for developing economically feasible methods for controlling aquatic vegetation in large canals are being conducted in cooperation with the Agricultural Research Service in the Denver Laboratory and on the Columbia Basin Project, Washington, and Central Valley Project, California.

## Poison on the Prairie Battled

A halogeton control program has been developed in cooperation with other agencies under provisions of the Halogeton Glomeratus Act in the interest of increasing the land use value of the lands under the jurisdiction of the Bureau and of protecting the livestock grazing on these lands. It is known that this poisonous weed infests Bureau lands in Utah, Nevada, Colorado, Wyoming, and Idaho. Surveys to locate halogeton infestations and cooperative investigations to determine the most effective and economical control methods continued. The actual control programs, including chemical spraying and grass seedings, were conducted primarily through agreements with the Bureau of Land Management.

The distribution of motion pictures, slide lectures, manuals, special releases on new equipment, and articles in the *Reclamation Era* are used to advise project personnel on new and more economical methods for controlling weeds.

### Seepage Losses Reduced

Another major aspect of water conservation is reduction of seepage through canals and laterals of irrigation systems. Since man's first attempts to transport water through canals, seepage has been a major problem. Such water losses increase the cost of that delivered to the consumer and often cause waterlogging of lands adjacent to the canals. Enough water to cover the entire State of Massachusetts to a depth of 1 foot is probably lost every year by seepage, since frequently the amount of irrigation water delivered to Bureau of Reclamation projects exceeds 20 million acre-feet and losses are estimated at from 25 to 50 percent. Since these losses occur in 90 percent of the canals and laterals involved, it is obvious that lining the distribution systems will effect a tremendous saving of water. Canal lining costs have been reduced considerably through research by the Bureau in cooperation with other Federal agencies, educational institutions, and industry.

Among the materials being investigated under the Lower-Cost Canal Lining Program are waterborne chemical soil sealants and stabilizers, compacted earth, plastics, asphalt membranes, prefabricated asphaltic linings, asphaltic concrete, and sediments. Each of these materials is being field and laboratory tested for comparison with methods and materials now used. Use of these materials, as well as the more expensive conventional linings, is explained in detail in the Bureau's recently released 1963 edition of "Linings for Irrigation Canals."

### Soil and Moisture Conservation Programs Advance

In keeping with its policy of conserving natural resources, the Bureau of Reclamation has continued its program of conserving soil and water on lands under its jurisdiction. These operations are being directed primarily toward erosion control, reduction of water losses, and the protection of Reclamation-built works.

The program objectives are accomplished in cooperation with other Federal agencies, as well as State, local, and water users' organizations. During 1963, there were 124 individual soil and moisture conservation programs on 71 Federal irrigation projects or units.

## Cooperation With Other Agencies Stressed

The Bureau's activities in planning, developing, and operating Federal irrigation projects and in conserving natural resources on lands under its jurisdiction have been greatly facilitated through cooperation with other agencies and organizations.

During 1963 there were in effect over 400 cooperative agreements with agencies in the Department of Agriculture with State colleges and extension services of the 17 Western States and Alaska, as well as many other Federal, State, and local organizations. They included studies and investigations on development farms, conservation activities, efficient use of soil and water, crop and cropping problems, assistance to county agricultural agents, and weed control. They covered also the development and management of reservoir, recreational, and wildlife areas, and assistance in solving many other problems pertaining to irrigation projects.

Cooperation with other agencies also includes participation in numerous departmental, indepartmental, basin, State, local, and other committees whose functions are related to the Bureau's interests and responsibilities.

Nearly completed Glen Canyon Dam is the backdrop for the preliminary flight of Project Polariscope, conducted by the University of Arizona and the National Center for Atmospheric Research to determine the polarization and scattering of radiation from the planets. The Bureau of Reclamation is cooperating with NCAR in the experiments.

### Vigorous Safety and Health Program Conducted

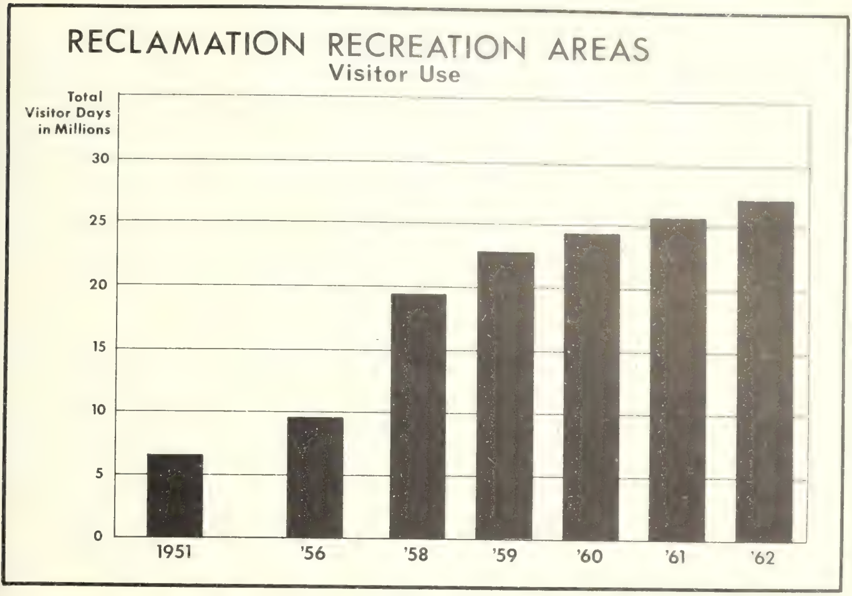
The Bureau's conduct of its vigorous and effective safety and health program was reflected in the fact that Reclamation completed fiscal 1963 with the lowest Government and contractor accident frequency rates in its history. Government forces completed the year with a cumulative accident frequency rate of 5.2, a 31.6-percent reduction from the previous year. Contractors' forces completed the year with an accident frequency rate of 21.4, an 11.2-percent reduction. Contractors' forces completed the year with 4,652 calendar days lost per million man-hours worked, the fourth lowest loss in Reclamation history. This represented a saving of 13,363 man-days' production compared with the previous year.

Continuing emphasis was placed on public safety to provide maximum protection for visitors to Reclamation installations and persons exposed to the hazards of drowning in canals, laterals, and reservoirs. After a thorough inspection of Reclamation irrigation facilities to insure compliance with safety standards hazardous conditions were corrected and provision was made for installing protective devices such as fences, barricades, and other facilities. Eleven additional water safety councils were organized in communities near Bureau irrigation projects. There were 1 active councils, sponsored by Reclamation and the American Rec Cross and meeting criteria established under the program known as Operation Westwide. The new councils were organized in areas designated as critical because of an existing hazard or increased public recreational activity.

To improve the administration of the Bureau's safety program a concerted effort was made during the year to staff Bureau safet positions with qualified career safety engineers.

## RECREATION INCREASES

Recreation use of Reclamation projects throughout the West ir creased greatly. In the early days of the Reclamation program dam was built solely to regulate river flow and to provide irriga tion for growing crops; the possibility of people's traveling to th often virtually inaccessible site for recreation purposes did n occur to the dam builders. But once a river was plugged by a da and water began to fill the valley behind it, the public beat a pat through the wilderness to the rim, to look at the expanse of in pounded water and the works of the dam itself, and soon to us



the water and shoreline for fishing, camping, and other recreational activities especially valued in the water-starved West.

As a result of better transportation and more leisure time, and a burgeoning population, what was an unplanned, incidental byproduct of Reclamation has ripened into a major fruit of the program. During calendar year 1962, a total of 27 million visitor-days was recorded at 191 Reclamation recreation areas.

In recent years provisions for public facilities have been included in plans for new Reclamation projects. However, one of the Bureau's most acute problems is the inadequacy of public facilities on older projects which were constructed without any provision for this function, and authority is being sought to provide such needed facilities. A breakthrough was made in fiscal 1963, when improvements were authorized for Elephant Butte and Caballo Reservoirs on the Rio Grande Project in New Mexico. Advance planning and surveying were undertaken, with construction scheduled for early fall of 1963.

Caballo Reservoir has virtually no public-use facilities, yet 62,000 recreation seekers visited it in 1962. At Elephant Butte, the limited facilities built before 1936, when 13,000 visitor-days were reported, were called upon in 1962 to accommodate 1,270,000 visitors. Such updating of facilities on other older projects is high on the priority list for Bureau needs if it is to meet the ever-increasing public demand for recreation.

Southwestern Wyoming boating enthusiasts enjoy an outing on the reservoir being formed by Flaming Gorge Dam on the Green River on the Utah-Wyoming border.

As development of the Upper Colorado River Basin Storage Project progresses, recreational benefits are included in the planning, since, for the first time in Reclamation history, the authorizing legislation for a large basinwide project listed recreation as one of the multiple purposes. When the long-range water resources development is finished, the entire 1,270-mile length of the Colorado will be the spine of a spectacular American playground for millions of sun worshipers, nature lovers, fishermen, and water sports buffs.

The self-guided tour program at leading Reclamation dams is being expanded by the Bureau. These tours, such as those now being conducted at Grand Coulee, Shasta, and Hungry Horse Dams, are proving very popular and they have the advantage of low cost and high enjoyment value. More and more visitors are evidencing interest in the actual physical works of the dams and powerplants, as well as in the sports the impoundments make possible. The self-guided tour may be taken at the visitor's leisure and convenience, with the opportunity to spend as much time as he likes on the attractions of his own choice and without the admission charge, which is necessary where guide service is maintained.

Construction started late in fiscal 1963 on a visitors' facilities building at Hungry Horse Dam in Montana, and was expected to be completed before winter under the Accelerated Public Works program.

With recreation now recognized as a major function of Reclamation development, and with the demand for it increasing beyond expectations on all water resource projects, the Bureau of Reclamation is utilizing all available water and land for this purpose under existing authorizations.

By far the greatest number of visitors to Reclamation recreation areas last year went primarily to view the scenery. Visitor-days recorded for sightseeing enjoyment totaled 10.2 million. Another 5 million days were spent fishing in reservoirs and other waterways. Picnicking accounted for 3.3 million visitor-days, water skiing for 2.5 million, camping for 2 million, boating for 1.6 million, and hunting for 0.2 million visitor-days.

## MANY FOREIGN ACTIVITIES ARRANGED

Oversea activities of the Bureau of Reclamation during fiscal 1963 were highlighted by start of two new projects, the completion of fieldwork in the Blue Nile Basin in Ethiopia, and the completion of two short-duration project reviews, one in Brazil and one in India.

At the request of the Agency for International Development and the Government of the Philippines, a Reclamation group went to Manila to assist in preparing multipurpose river basin development plans for the seven major rivers of the Philippines. This program is expected to take a minimum of 2 years and may be extended.

The other new project is the first phase of the feasibility study of the Pa Mong Project on the Mekong River between Thailand and Laos. This is a portion of the overall study of the Mekong River being accomplished on a multination basis under general direction of the Economic Commission for Asia and the Far East.

a United Nations agency. It is also scheduled for two years, with additional phases dependent on the findings of this initial study. The Bureau's participation is under the sponsorship of AID.

Reclamation personnel and facilities continued to be in demand for short-term consultations and planning and design review. In addition, the Bureau assisted foreign governments in solving technical problems in construction, operation and maintenance, farm settlement, agricultural economics, drainage, and other related fields.

Although the major portion of the requests for assistance was received through the Agency for International Development, services also were provided to the United Nations, the International Bank for Reconstruction and Development, the Pan American Union, the Inter-American Development Bank, and, in some instances, directly to various foreign governments.

As in the past, technical training and observation programs were provided for a steady stream of professional personnel from all over the world. Most of the 111 individuals came to the United States under auspices of the Agency for International Development. Others were sponsored by the United Nations, the trainees' own governments, Eisenhower Exchange Fellowships, Inc., and similar organizations.

The Bureau provides training and technical assistance to trainees through giving them (1) the individual inservice experience of working side by side with personnel of the Chief Engineer's staff and the Denver laboratories; (2) by taking them to various regional and planning offices, as well as construction and operating projects for instruction and pertinent details; and (3) by assigning them to carefully selected projects for the purpose of "learning by doing."

The keen interest in these programs is reflected by the many visits of foreign officials to Bureau offices. Of particular note in 1963 was the State visit to the Denver facilities of His Excellancy Dr. Sarvepalli Radhakrishnan, President of the Republic of India, whose party included the Honorable Kenneth Galbraith, then-Ambassador to India.

## SUPREME COURT DECIDES WATER ISSUES

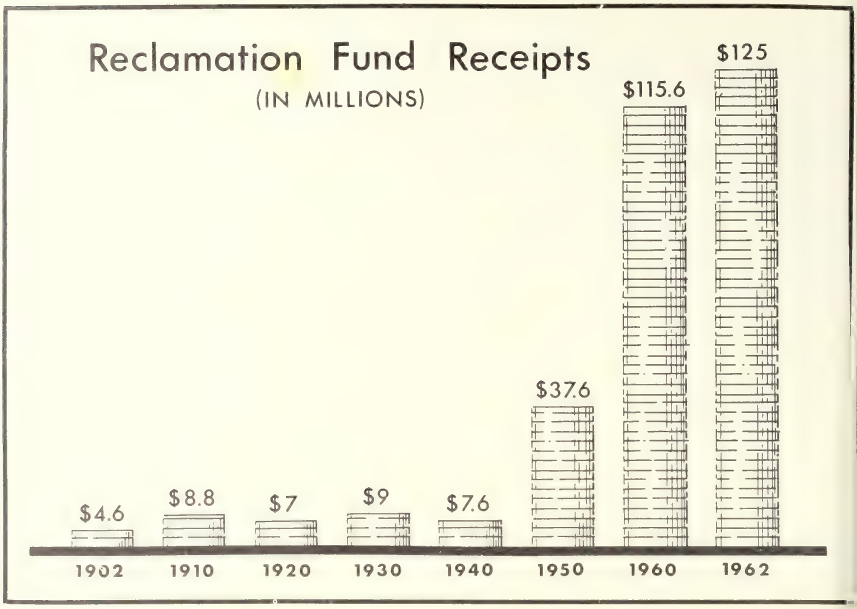
Two matters of vital concern to the Bureau of Reclamation were subjects of Supreme Court decisions during 1963.

The *Arizona* v. *California* case, involving the rights of the two States to the waters of the Lower Colorado River and its tribuaries, was decided after 13 years' litigation. The Court held that he statutory apportionment of the waters of the Colorado River nainstream under the Boulder Canyon Project Act must be used is a guide in allocating the water of the Lower Colorado, having 'ound that the Colorado River Compact was not controlling and iaving rejected the law of prior appropriations and the doctrine of equitable apportionment as a basis for resolving the water laims as between the States concerned. The Court left control of the tributaries with the States in which they flow, without charging the same to the apportioned water.

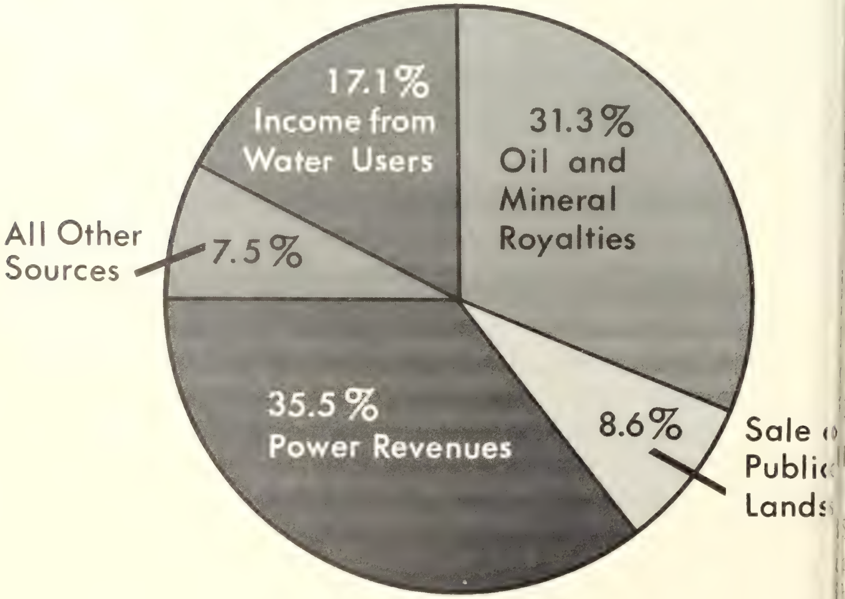
California was allotted 4.4 million acre-feet of water annually rom the mainstream, Arizona 2.8 million acre-feet, and Nevada 00,000 acre-feet; and the Secretary of the Interior was found to iave authority within the confines of the act to allocate and disribute water in times of shortage.

Regarding the cases of *Dugan* v. *Rank* and the *City of Fresno* . *California et al.*, the Supreme Court affirmed the decision of the ourt of appeals that the injunction against the United States e dismissed. This case resulted from the impounding and diverion of San Joaquin River water by the Federal Friant Dam for use lsewhere in the Central Valley Project for Federal irrigation of inds, which diversion terminated prior uses of the water on acrege from Friant Dam to Mendota Pool. Several of those users so ffected had been seeking since 1947 to enjoin diversion and storge of water there.

The Court held that the injunction would not lie against either e United States or local officials of the Bureau of Reclamation, ating that any relief to which the water users might be entitled reason of the taking by the United States of the water involved ould be by suit against the United States under the Tucker Act.



Sources of Reclamation Fun



# Bonneville Power Administration

## Charles F. Luce, Administrator

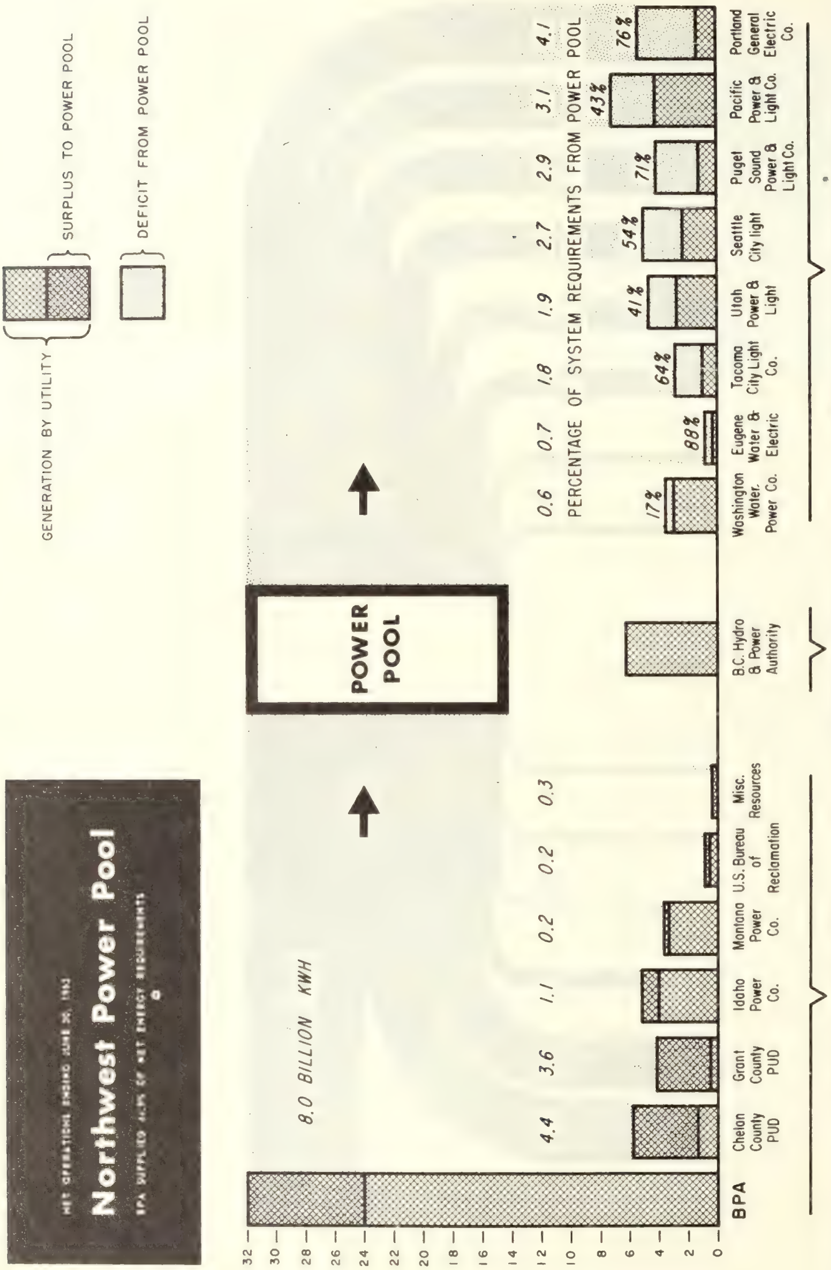
On May 21, 1963, the Bonneville Power Administration became the marketing agency for power generated at all Columbia River Basin Federal hydroelectric projects in the Pacific Northwest. A secretarial order, which became effective immediately, extended the Administration's marketing area to the 61,000-square-mile Upper Snake River drainage, including all of southern Idaho and small adjoining areas in Wyoming, Utah, and Nevada.

The order directed BPA to integrate the Upper Snake Federal hydroelectric plants with those in the rest of the Columbia River Basin, to make its standard wholesale rates effective in the area and transfer the Bureau of Reclamation power and transmission facilities, personnel, and accounts as soon as possible. The Bureau of Reclamation will continue to operate its projects for irrigation and related purposes.

All preference customers in the southern Idaho area—municipalities and rural electric cooperatives—formerly purchasing power from the Bureau of Reclamation, became customers of BPA. The ower wholesale rates of the BPA are expected to result in savings of approximately 40 percent in the first year and provide low-cost power for development of phosphate and other industrial resources.

## Federal Generation Increases

The U.S. Columbia River Power System, with addition of the Snake River Basin plants in southern Idaho, increased its installed generating capacity to 6,653,150 kilowatts. The Idaho plants have a nameplate rating of 163,900 kilowatts. An additional 8,860 kilowatts of Federal generation produced by isolated Navy,


NET OPERATIONS ENDING JUNE 30, 1963
Northwest Power Pool
BPA SUPPLIED 46.9% OF NET ENERGY REQUIREMENTS
GENERATION BY UTILITY
SURPLUS TO POWER POOL
DEFICIT FROM POWER POOL
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
8.0 BILLION KWH
POWER POOL
PERCENTAGE OF SYSTEM REQUIREMENTS FROM POWER POOL
4.4
3.6
1.1
0.2
0.2
0.3
0.6
0.7
1.8
1.9
2.7
2.9
3.1
4.1
17%
88%
64%
41%
54%
71%
43%
76%
BPA
Chelan County PUD
Grant County PUD
Idaho Power Co.
Montana Power Co.
U.S. Bureau of Reclamation
Misc. Resources
B.C. Hydro & Power Authority
Washington Water Power Co.
Eugene Water & Electric
Tacoma City Light Co.
Utah Power & Light
Seattle City light
Puget Sound Power & Light Co.
Pacific Power & Light Co.
Portland General Electric Co.
SURPLUS POWER TO POOL
GENERATION EQUAL TO LOAD
GENERATION DEFICIT . . POWER FROM POOL

Bureau of Reclamation, and Bureau of Indian Affairs plants is not marketed by BPA.

Completion of plants under construction—Cougar, Green Peter, Foster, John Day, Lower Monumental, Little Goose, and Bruces Eddy—will give the Federal system an installed capacity of 9,248,150 kilowatts. Construction of authorized Federal projects would increase the nameplate rating to 10,319,650 kilowatts.

Construction funds were appropriated in October 1962 for the Little Goose and the newly authorized Bruces Eddy Projects in the Snake River Basin. Projects authorized at the same time were Asotin on the Snake River, Strube on the South Fork McKenzie River, and Lost Creek on the Rogue River.

Storage capacity in Federal reservoirs usable for power was 12,171,300 acre-feet. Projects under construction will add 2,487,000 acre-feet, and Libby Dam, an authorized project, could add 5,010,000 acre-feet when a treaty with Canada is ratified.

## Non-Federal Generation Also Gains

Non-Federal generation in the expanded area served by Bonneville Power Administration totaled 6,632,810 kilowatts of installed capacity, including the addition in fiscal 1963 of 120,000 kilowatts at the Mayfield plant of the city of Tacoma and 10,000 kilowatts at the Trail Bridge plant of the city of Eugene. Scheduled additions, under construction, or licensed projects would add about 3,861,330 kilowatts.

## Northwest Power Pool

Generation by principal electric utility systems of the Pacific Northwest during fiscal 1963 is shown in an accompanying chart.

Fifty percent of the energy generated by the major utilities of the region was provided by the U.S. Columbia River Power System. In addition to its other load, the Bonneville Power Administration provided 8 billion kilowatt-hours of energy to meet the net requirements of 8 other pool utilities.

Table 2 summarizes Federal and non-Federal generation in the Pacific Northwest.

## Non-Federal Power Wheeled

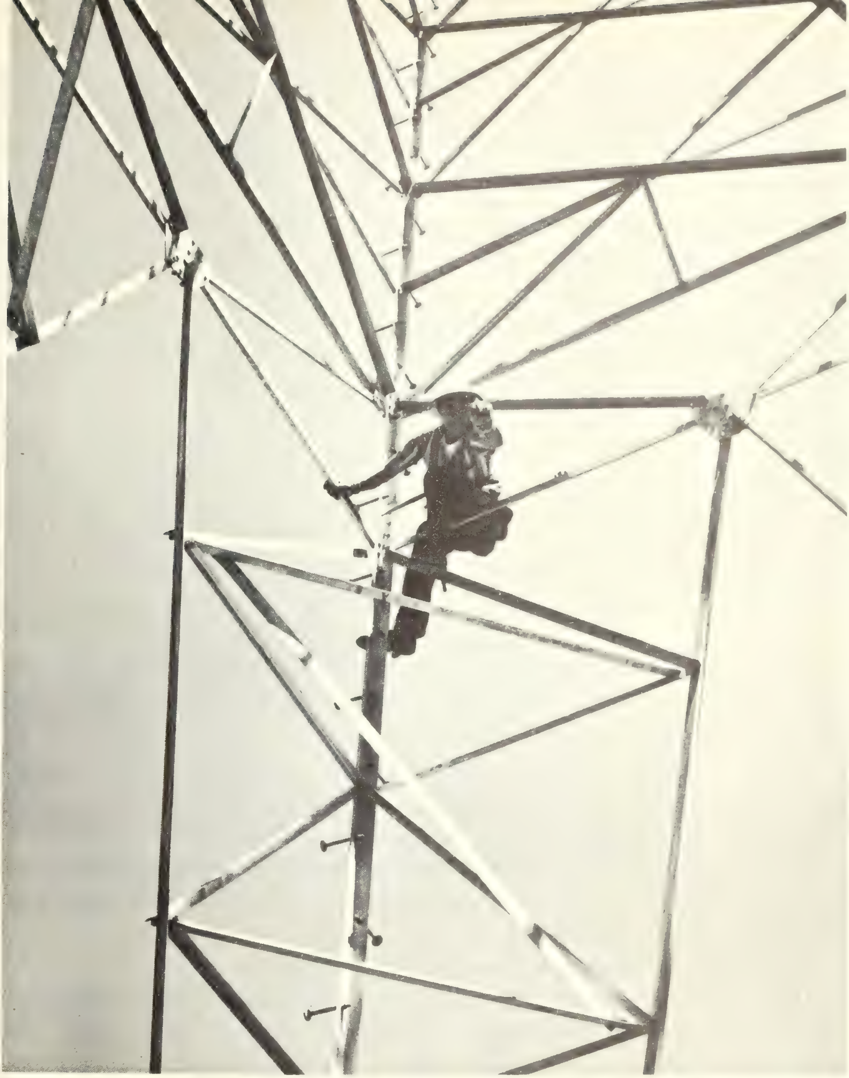
The Bonneville Power Administration wheeled or transferred for other utilities 10.7 billion kilowatt-hours of energy in fiscal 1963.

This compares to 11 billion kilowatt-hours wheeled or transferred during fiscal 1962.

Power is being delivered under long-term firm capacity contracts from the Pelton Project of the Portland General Electric Co., the Box Canyon Project of the Pend Oreille County Public Utility District, the Rocky Reach Project of the Chelan County Public Utility District, and the Carmen-Smith project of the city of Eugene.

Excess capacity contracts cover power from the Swift Project of the Pacific Power & Light Co., the Rock Island Project of the Chelan County Public Utility District, the Mayfield Project of the city of Tacoma, and from the Priest Rapids Project of Grant County Public Utility District and into the region from the Idaho Power Co.

An artist's sketch depicts the Hanford, Wash., new production reactor and electric power generating facilities which will add 800,000 kilowatts to the region's power resources.



A line crew foreman is directing steel assembly on a BPA light steel tower in the Willamette Valley area.

## Hanford Steam Generation Authorized

In fiscal 1963, congressional legislation authorized the Washington Public Power Supply System to contract with the Atomic Energy Commission for lease of land, purchase of reactor byproduct steam, and other necessary arrangements for producing electric power by utilizing nuclear fuel at the Hanford Works. The power output of the reactor-fueled generation is estimated at 800,000 kilowatts. Exchange agreements among the BPA, WPPSS, and purchasers of the project output were completed to permit the interchange of power and effectively integrate the NPR with West Group Area resources.

## Transmission System Reaches 8,910 Miles

The Bonneville Power Administration, since it placed its first line into operation 25 years ago, has grown into a network of 8,910 circuit-miles of high-voltage transmission lines and 248 substations of 14,895,345-kilovolt-amperes transformer capacity. This reflects an average yearly growth of 356 miles of lines and 595,810 kilovolt-amperes transformer capacity. Latest additions included 238 miles of transmission lines and 24 substations of 223,850-kilovolt-amperes transformer capacity in southern Idaho. The present system reactive capacitance is 2,752,000 kilovolt-amperes.

## Construction Progresses

Key facilities under construction at year's end included:

A second 33-mile, 230,000-volt line between Chehalis and Longview, Wash., to reinforce the Administration's system in the Longview area of southwestern Washington.

A 70-mile, 500,000-volt line between Arlington and Blaine, Wash., to provide transmission capacity for delivery to the Canadian border of secondary power for sale to British Columbia and to carry a portion of Canada's share of the downstream benefits resulting from the Canadian storage treaty. Initially, this line will be operated at 230 kv.

A 93-mile, 230,000-volt line between the Administration's Bell substation, near Spokane, Wash., and the Canadian boundary north of Metaline Falls to provide an interconnection with the West Kootenay Power & Light Co., Ltd., to interchange energy and to permit regulation of water resources. This line also will enable the Administration to deliver to Seattle a portion of the output of the city of Seattle's Boundary hydroelectric plant.

A 110-mile, 500,000-volt line between Big Eddy, near The Dalles, Oreg., and Keeler, near Portland, to be operated initially at 230,000 volts. This line will reinforce the Portland and Willamette Valley transmission system, transmit power to the Portland area, initially from The Dalles and later from the John Day hydroelectric plants, and wheel from non-Federal plants on the Columbia River.

A 120-mile, 500,000-volt line between Vantage, Wash., and Covington to serve the load growth in the Puget Sound area and to provide a normal level of reliability.

A 73-mile, 230,000-volt line between Alvey substation, near Eugene, Oreg., and Tahkenitch, near Reedsport, Oreg., to serve increasing load in the central part of the Oregon coastal area.

A 47-mile, 230,000-volt line between Olympia, Wash., and Aberdeen, Wash., to prevent overloading of existing lines when outages occur.

A 13-mile, 115,000-volt line between Kitsap, near Bremerton, Wash., and Bangor to provide additional power to the U.S. Naval Ammunition Depot at Bangor, Wash., and the Naval Torpedo Sta- ion at Keyport, Wash.

A 10-mile, 115,000-volt line between North Bonneville and Stevenson, Wash., to serve the load growth in the Stevenson area.

## ntertie Proposals Studied

During the year, analyses were made of seven non-Federal roposals for constructing Pacific Northwest-Pacific Southwest nterties.

The proposals included transmission plans similar to those in the tudy completed by a Departmental task force in November 1961.

The Bonneville Power Administration recommended to the House nd Senate Appropriations Committees:

> A 750,000-volt direct-current transmission line from the Columbia River to the Los Angeles area through western Nevada, constructed jointly by the BPA and the Bureau of Reclamation; and
>
> A 500,000-volt alternating current transmission line from the vicinity of John Day Dam to the Oregon-California border, constructed by the BPA and connected with a similar line to be constructed in California by non-Federal entities.

The BPA also presented the committees with detailed analysis the non-Federal proposals. The BPA does not propose selling urplus power to California customers until Congress has enacted gislation defining the primary marketing area of the Bonneville ower Administration and establishing the ground rules for sale d exchange of surplus power outside the region.

Studies were in progress during fiscal 1963 on a proposed Mis- uri Basin-Pacific Northwest extra-high-voltage interconnection.

## orm Damages Heavy

The Bonneville Power Administration's transmission system un- rwent one of its severest tests during the Columbus Day storm at swept western Oregon and Washington coastal areas Octo- r 12, 1962. A windstorm of hurricane force with wind veloci-

Hurricane force winds of up to 116 miles per hour reduced BPA's 500-foot Columb
River crossing to a mass of twisted steel, as pictured above, in October 1962.

ties up to 116 miles per hour struck Gold Beach, Oreg., at 2 p.m
and moved northward as far as Port Angeles, Wash. By 6 p.m
the system load dropped to 50 percent of normal.

There were one or more interruptions to 42 transmission line
which resulted in over 60 power failures at 48 substations. Oth
electric utilities in the area suffered severe damage to their ove
head distribution systems, causing extensive power outages of lo
duration.

## BPA Service Restored Rapidly

The BPA restored power to 75 percent of the substations within 8 hours, 90 percent within 24 hours, and all stations were in service within 48 hours. Some customers transferred part of their load to other BPA power sources, but in most cases complete restoration of service to their customers was delayed for several days, until distribution lines were repaired. BPA service was not interrupted to any major industrial customer during the storm. However, one aluminum plant was shut down because of damage to its facilities.

Following is a summary of the major damage to the BPA system, which totaled about $1,200,000: Destroyed were two 550-foot transmission line towers on the Columbia River crossing at Vancouver, Wash., a 412-foot transmission line tower on the Washington side of the Columbia River crossing near Longview, a steel tower on one 230-kv transmission line and 2 steel towers on another 230-kv line; 17 wood structures on 115-kv transmission lines were blown down; conductors and steel towers on one 115-kv transmission line were damaged so badly by falling trees that 5 days were required for repairs; another 115-kv transmission line had about 30 trees in the line and 3 spans of conductor on the ground.

## Gross Revenues Gain

The Bonneville Power Administration's gross revenues for fiscal 1963, on the basis of preaudit figures, were $77,704,000, a gain of $3,221,000, or 4.32 percent, over 1962. Energy sales totaled 30.2 billion kilowatt-hours at an average rate of 2.38 mills per kilowatt-hour, for $71,978,000. Miscellaneous revenues, principally charges for wheeling non-Federal power over the Federal system, were $5,726,000.

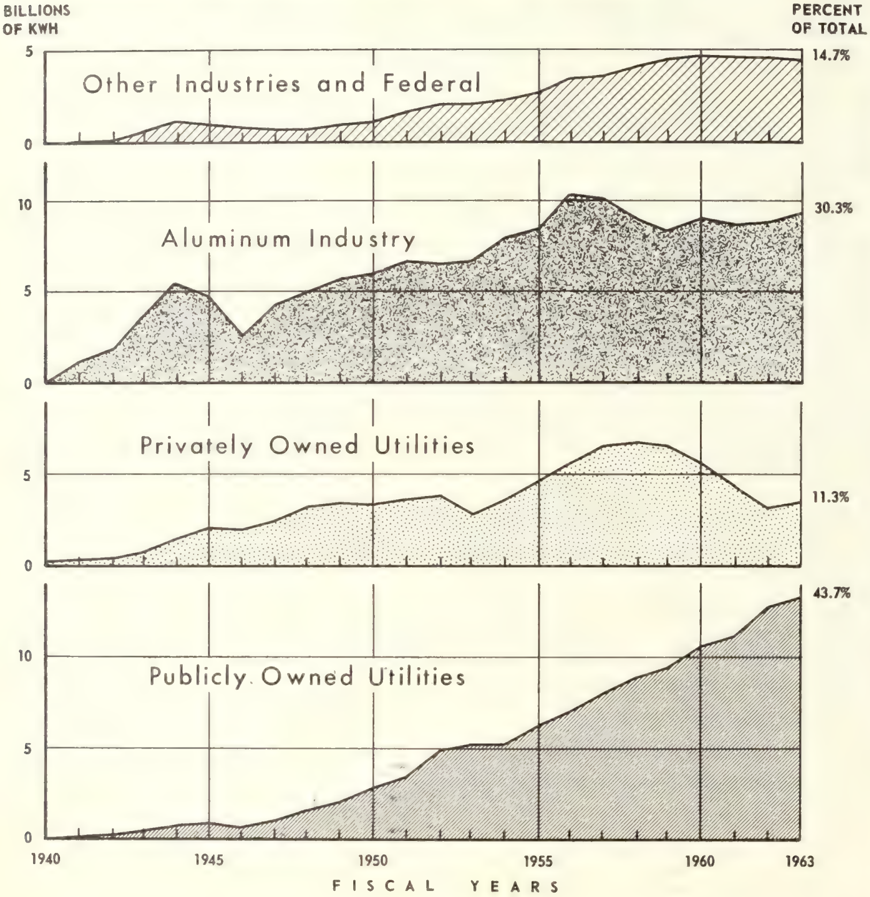
Since beginning operations in 1938, the Bonneville Power Administration has sold 393 billion kilowatt-hours of hydroelectric energy at an average rate of 2.35 mills per kilowatt-hour. Total sales revenues were $926,000,000 and will pass the billion-dollar-mark during fiscal 1964.

## Energy Sales and Revenue Trends Shown

Trends in energy sales are illustrated in an accompanying chart. Comparative energy sales by classes of customers for fiscal 1962 and 1963 are shown in table 4.

Revenue and revenue trends for fiscal years 1956 through 1963 are presented in table 5. The table contains trend percentages for each class of customer and for miscellaneous power revenues to show more clearly the annual variations and longer term trends.

# Sales of Electric Energy by Class of Customer



Total sales of electric energy increased 20 percent during the 8-year period. More significant, however, is the reduction in sales to the aluminum industry and privately owned utilities, compared to the continuous growth in sales to the publicly owned utilities. A 20-percent gain for total sales obscures the fact that firm power sales rose 36.8 percent during the 1956–63 period, but nonfirm sales fell 50 percent.

Firm power sales of $66,321,000 in 1963 represented a gain of 6.9 percent over 1962. However, nonfirm sales of $5,657,000 in 1963 were down 19.5 percent from the preceding year. Nonfirm sales often show wide fluctuations from year to year. For example, 1962 was considerably above 1961, due to increased purchases by the industries and both private and public utilities. In 1963, on the other hand, both classes of utilities substantially reduced nonfirm purchases. Streamflow conditions and demands for aluminum are basic factors affecting nonfirm sales.

## Sales to Aluminum Plants

Firm sales to the aluminum industry continued to rise through 1960. This represented the addition of potlines by the industry. At the same time, beginning with 1958, some of the aluminum plants curtailed their firm power loads. In fact, curtailment during the period 1958 to 1963 represented an aggregate loss of $5,500,000 in revenue to the Administration. An additional revenue loss resulted when the Aluminum Co. of America switched part of its service from the Federal system to the Chelan County PUD's Rocky Reach Dam Project when it was completed. This was in accordance with previously arranged contracts and had been anticipated.

Nonfirm sales to the aluminum industry showed a small drop in 1957 and then fell very rapidly to a low point in 1961, which was only about 28 percent of the 1956 level. Some recovery of interruptible sales to this industry occurred in the 2 years following 1961.

However, aluminum operations increased during the past 2 years due to somewhat improved market conditions for the industry. At the end of fiscal 1963 there was little firm power curtailment and plants were operating at about 65 percent of their interruptible power capacity. Prospects for further improvement in aluminum power sales appear to be good.

Pacific Northwest aluminum companies were producing 52 percent of the Nation's primary aluminum in 1948, but in 1962 were producing only 26 percent of that total.

## Sales to Private Utilities Drop

Firm power sales to privately owned utilities decreased rapidly after fiscal year 1959, with some recovery in 1960. The decrease can be attributed primarily to the development of sources of supply other than the BPA. These provided power supply in excess of the load growth requirements of the privately owne utilities. The new sources of supply include construction of private generating projects and purchases of substantial power fron publicly owned utilities which have constructed large hydroelectric plants on the main stem of the Columbia River. These sam sources of supply also have provided large amounts of secondar power which has resulted in decreasing BPA's nonfirm sales to th privately owned utilities.

## Public Utility Sales Up

Sales to publicly owned utilities have shown a steady increase amounting to $16,600,000, or 85 percent over the 7-year perioc

Miscellaneous revenues increased severalfold over the 1956–6 period. This growth has resulted primarily from two factors charges for wheeling non-Federal power and payments for cc ordination and storage benefits. The major portion of the ger eration at the new non-Federal plants is "wheeled" over the Fec eral transmission network to avoid duplication of facilities. Th non-Federal utilities in each of the past 2 years have made sul stantial payments for benefits from coordination with the Feder system and from upstream Federal reservoirs.

## Unfavorable Trends Listed

Even though 1963 revenue represented a new peak, net financi results have declined during the past 6 years.

Sales of energy have not kept pace with the increase in installe capacity. This is shown in the following table:

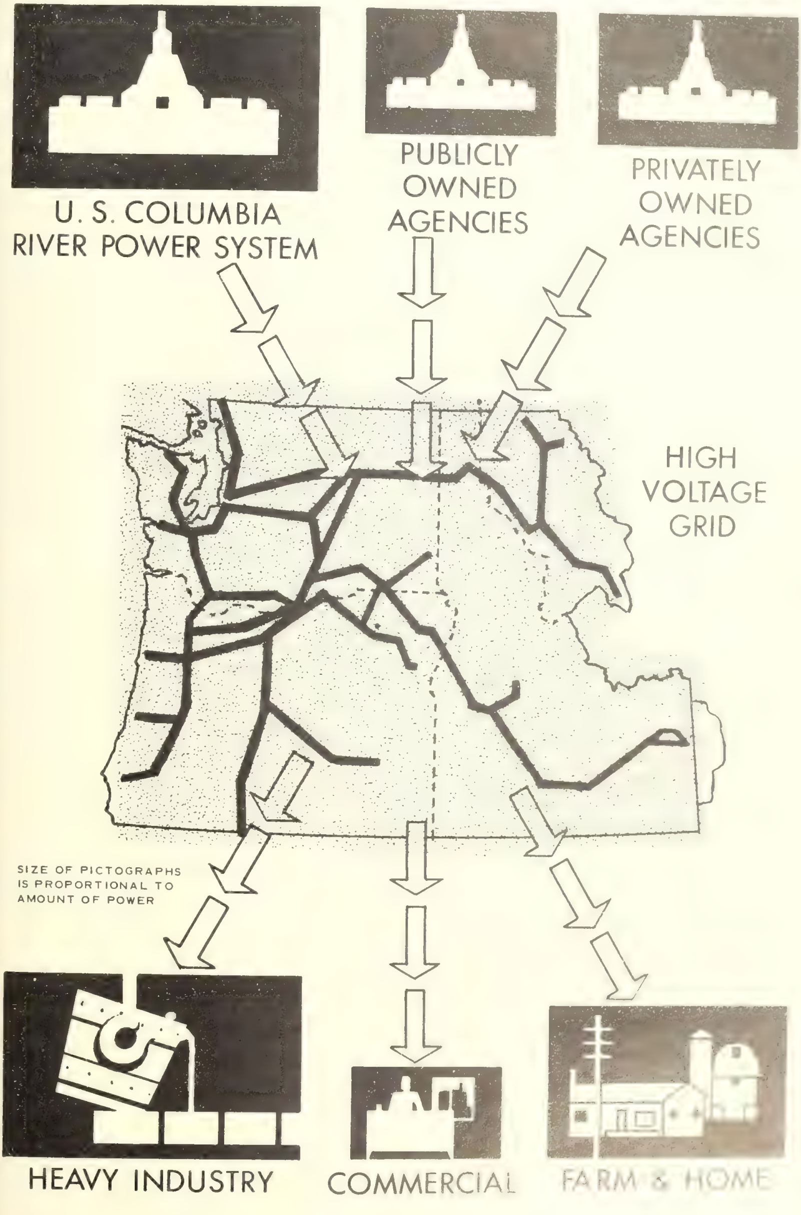
*Bonneville Power Administration: Sales of electric energy and June 30 installed capacity*

| Fiscal year | Sales of electric energy ($1,000) | Installed capacity (kw) | Percent annual change from previous year | |
|---|---|---|---|---|
| | | | Sales | Capacit |
| 1954 | $44, 127 | 3, 145, 400 | 15. 0 | 2 |
| 1955 | 51, 259 | 3, 588, 800 | 16. 2 | 1 |
| 1956 | 59, 790 | 4, 151, 000 | 16. 6 | 1 |
| 1957 | 64, 972 | 4, 702, 000 | 8. 7 | 1 |
| 1958 | 64, 704 | 5, 334, 000 | (. 4) | 1 |
| 1959 | 66, 860 | 5, 721, 250 | 3. 3 | |
| 1960 | 68, 944 | 6, 033, 250 | 3. 1 | |
| 1961 | 66, 995 | 6, 189, 250 | (2. 8) | |
| 1962 | 69, 054 | 6, 489, 250 | 3. 1 | |
| 1963 | 71, 978 | 6, 489, 250 | 4. 2 | |

( ) Decrease.

NOTE: The sales data do not include revenues from miscellaneous sources, such as wheeling of Federal power over the Federal transmission network.

# ESTIMATED PACIFIC NORTHWEST POWER GENERATION & USE, 1963



Energy sales for the 1954–7 period increased an average of 14.1 percent per year, compared with an annual increase of 16 percent for installed capacity. Except for some faltering in 1957, the sales average and capacity figure would have been almost identical. Since 1957, energy sales have shown an average annual increase of only 1.8 percent, compared to 6.3 percent for installed capacity. Sales in 1963 were 10.8 percent over those of 1957, but installed capacity increased 38 percent.

One of the most important underlying causes for the unfavorable trends since 1957 has been the failure to construct new projects on a schedule permitting orderly marketing of firm power. Even though for the first time in many years there was no increase in the installed capacity of Federal Columbia River generation in 1963, several large non-Federal plants are scheduled for service in the near future or have been placed in service in recent years. These displace sales of Federal power and create temporary surpluses of firm power on the Federal system. Inability to find markets for this firm power, which is only temporarily surplus, and for a large quantity of surplus secondary power on the Federal system resulted in unsold Federal power representing a potential additional revenue of $157 million during the past 6 years, ranging from $12,700,000 to as high as $32 million in individual years of the period.

Adverse economic conditions which developed in 1958 slowed the load growth of the Administration's power distributors and resulted in substantial curtailment by BPA's large industrial customers during portions of the past 6 years. There was considerable improvement in the rate of industrial operations near the end of the fiscal year. As an example, the largest aluminum reduction plan in the Northwest had only three of its eight potlines in operation at times in recent years, but was operating at full capacity at th end of fiscal 1963. The improved conditions in the aluminum industry came too late to show substantial gains in 1963, but should be evident in fiscal 1964.

## Revenues Cover All Costs

Despite unfavorable sales trends, revenues of the power system from 1958 to 1963, inclusive, have covered all power operation maintenance, and interest expenses, and repaid approximatel $100 million of power construction costs to the Treasury. Eve though substantial returns have been made on construction costs the amounts have not come up to the previously established "benchmark" schedules for amortization of the capital investment.

The U.S. Columbia River Power System therefore has reported "deficits" during the 1958–63 period, even though the system was "in the black" as of June 30, 1963, on an accumulative basis. The reported deficits have not been "out-of-pocket losses," since all expenses have been covered by a substantial margin. They have been deficits only when measured by an arbitrary yardstick as to the requirements or schedules for amortization of the capital investment.

## Repayment Policy Reviewed

Confronted with the possibility that present wholesale power rate levels may have to be raised, an analysis of amortization policies becomes necessary. A policy governing the rate and manner of repaying the power investment has not been critically reexamined since the completion of the first 2 dams of what is now a 15-dam system.

## Consolidated System Payout Announced

A consolidated system 50-year payout plan was announced by the Secretary of the Interior April 17, 1963. Prior to that, requirements were arrived at by a simple summation of the annual payout obligations computed over a 50-year period separately for each dam. The new plan follows that being used by most of the other major river basin power systems of the Department of the Interior, including the Central Valley Project in California and the Missouri River Basin Project.

While the revised payout schedule will reduce BPA's present repayment obligations by $7 million to $9 million annually, there will be no change in total obligations. A consolidated system approach is used to provide for repayment of the system investment over a combined period extending 50 years after completion of the last project in the system. Revenues and repayment requirements are pooled on a system basis so that as earlier units complete their payout periods, their revenues become available to assist in the repayment of newer projects.

## Reporting Format Studied

Concurrent with the adoption of a system payout plan, the Administration started a thorough review of the manner in which financial results of the operations of the U.S. Columbia River Power System are to be reported. The financial statements that have been published in the past in the annual auditors' reports have necessarily been substantially pro forma in character. This follows from the facts that for several of the generating projects the cost allocations have been and continue to be tentative or obsolete and for a few of the projects the data were based upon memorandum accounts rather than official accounts of the projects.

Studies are being made of revised formats for financial statements that will give full and proper disclosure to the official accounts and to the status of repayment of the power investment.

## All Costs Rise

The Administration's wholesale power rate, lowest in the Nation for large blocks of power, has remained unchanged for 25 years, predating World War II, even though costs of all kinds rose substantially during this period. Construction costs, salaries, wages, materials and services—all affecting annual charges—have been offset to a large degree by technological advances in power transmission but have resulted in substantial increases in the cost of power supply.

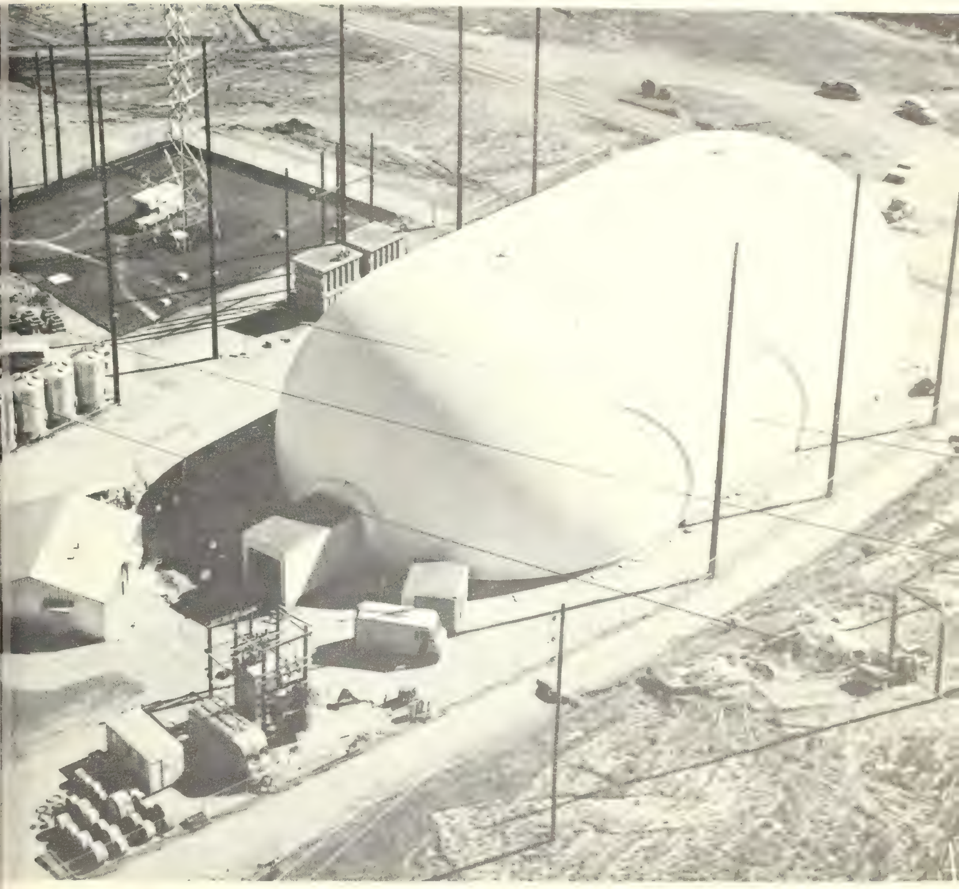
The BPA's cost per kilowatt-hour of power handled has been about 1 mill for several years, but is now significantly less than 1 mill per kilowatt-hour. This is the result of engineering improvements, including high-capacity, large-volume transmission facilities and the more intensive use of transmission investment brought about by the increased volume, particularly the wheeling of non-Federal power. There is less room, on the other hand, for technological improvement in hydroelectric generation because of the present high stage of efficiency. Some of the new power sites have been less favorable than the first ones developed, resulting in cost increases.

## High-Voltage Laboratory Completed

Two important steps were taken during the year in advancing the technology of high-voltage power transmission in both alternating and direct current.

Clearing operations started on the right-of-way for the first 500,000-volt alternating-current transmission line, and construction started on a $2 million direct-current transmission test center.

Continuing engineering and economic studies have demonstrated conclusively the advantages of a 500,000-volt alternating current grid overlay for the future transmission system. The transition to 500,000-volt transmission has required extensive investigation of conductor design and configuration, tower requirements, corona phenomena, insulation levels, radio interference, and similar problems. Completion of the Charles E. Carey high-voltage laboratory at the J. D. Ross substation has made it possible to conduct many of the tests and investigations with BPA equipment and facilities.



An air supported plastic dome—200 feet long, 100 feet wide and 58 feet high—completed in June 1963, houses the power supply and equipment for BPA's $2,000,000 direct-current transmission test center.

## Direct-Current Test Center Starts

Construction was well underway on Bonneville Power Administration's high-voltage direct-current test center, first of its kind in the United States. A huge air-supported plastic dome housing the direct-current power supply and testing equipment is 200 feet long, 100 feet wide, and 58 feet high. The plastic dome, costing a third less than a comparable rigid structure, was completed in June 1963 and work was begun on installing the massive rectifier units. Completion of the test equipment and test line was scheduled for September.

A contemplated two-year test program is an important element in America's contribution to technological leadership in direct-current power transmission. The new technique of power transmission will make transportation of large blocks of energy over distances of 1,000 to 2,000 miles economically feasible.

Power from the adjacent Big Eddy substation, near The Dalles, Oreg., will be converted from 13,800 volts alternating current to 1,100,000 volts direct current. Combined with the test line, the facility will produce the electrical voltage stresses associated with actual long-distance direct-current transmission. Data will be provided to establish standards for insulation and conductor spacing and size, together with investigation of conductor radio noise problems, insulator contamination, leakage, and flashover phenomena.

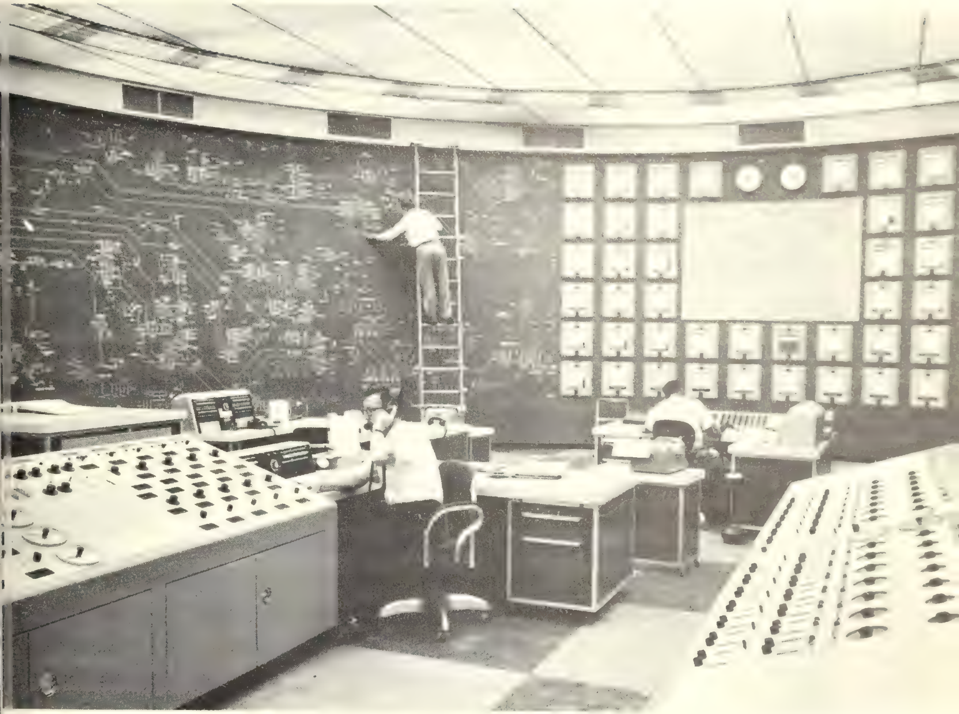
### New Control Equipment Installed

New load-frequency control equipment for the U.S. Columbia River Power System was installed at the Portland system control center in July 1962. It provides automatic regulation of generation at Bonneville, The Dalles, McNary, Chief Joseph, and Grand Coulee powerhouses in accordance with system electrical conditions and manually set schedules of participation. System control based on constant frequency with automatic time correction, or tieline bias, may be selected.

Present plans for interregional transmission lines include the requirement for tieline bias control to limit the magnitude of power fluctuations during normal operating conditions on such lines. Full use of tieline bias control cannot be realized until new telemetering and control equipment is placed in service. Benefits from the installation have already included a less severe duty cycle at the regulating powerhouse, rapid automatic recovery from some kinds of system emergencies, and close control of system time.

### Radio Noise Telemetry

A radio noise telemetry system was developed for detecting radio influence current in an energized transmission line. The information detected during the test period is transmitted via low power, very-high-frequency radio to the place where it will be recorded on a punched tape so that information can be analyzed on automatic data-processing equipment. The radio telemetry system will play an important part in the radio noise investigation associated with the high-voltage direct-current test program and in future high-voltage development work.



his new load frequency control equipment, installed at the Portland control center of he U.S. Columbia River power system during 1963, provides automatic regulation of eneration at Bonneville, The Dalles, McNary, Chief Joseph and Grand Coulee powerouses.

## Canadian Treaty Liaison Maintained

Continuing liaison and exchange of technical information was maintained during the year on various aspects of the pending Columbia River storage treaty with Canada.

A long-term coordination agreement was being negotiated with he principal non-Federal generating utilities of the region, repesenting operation of some 100 projects. A second 1-year co-rdination contract with BPA was signed during 1963 and will rovide further experience and knowledge for coordination of perations when the Canadian treaty is implemented.

TABLE 1.—*U.S. Columbia River Power System—General specifications, projects existing, under construction and authorized June 30, 1963*

| Project | Operating agency [1] | Location | Stream | Plant installations: Number of units | Plant installations: Total capacity kilowatts [2] | Date in service (initial unit) |
|---|---|---|---|---|---|---|
| Existing: | | | | | | |
| Primary system: | | | | | | |
| Bonneville | CE | Washington-Oregon | Columbia | 10 | 518, 400 | June 1938. |
| Grand Coulee | BR | Washington | do | 18 | 1, 944, 000 | September 1941. |
| Hungry Horse | BR | Montana | South Fork Flathead | 4 | 285, 000 | October 1952. |
| Detroit | CE | Oregon | North Santiam | 2 | 100, 000 | July 1953. |
| McNary | CE | Washington-Oregon | Columbia | 14 | 980, 000 | November 1953. |
| Big Cliff | CE | Oregon | North Santiam | 1 | 18, 000 | June 1954. |
| Lookout Point | CE | do | Middle Fork Willamette | 3 | 120, 000 | December 1954. |
| Albeni Falls | CE | Idaho | Pend Oreille | 3 | 42, 600 | March 1955. |
| Dexter | CE | Oregon | Middle Fork Willamette | 1 | 15, 000 | May 1955. |
| Chief Joseph | CE | Washington | Columbia | 16 | 1, 024, 000 | August 1955. |
| Chandler | BR | do | Yakima | 2 | 12, 000 | February 1956. |
| The Dalles | CE | Washington-Oregon | Columbia | 16 | 1, 119, 000 | May 1957. |
| Roza | BR | Washington | Yakima | 1 | 11, 250 | August 1958. |
| Ice Harbor | CE | do | Snake | 3 | 270, 000 | December 1961. |
| Hills Creek | CE | Oregon | Middle Fork Willamette | 2 | 30, 000 | May 1962. |
| Upper Snake River System: [3] | | | | | | |
| Minidoka | BR | Idaho | Snake | 7 | 13, 400 | May 1909. |
| Boise Diversion | BR | do | Boise | 3 | 1, 500 | 1912. |
| Black Canyon | BR | do | Payette | 2 | 8, 000 | 1925. |
| Anderson Ranch | BR | do | South Fork Boise | 2 | 27, 000 | December 1950. |
| Palisades | BR | do | Snake | 4 | 114, 000 | February 1957. |
| Subtotal | | | | | 6, 653, 150 | |
| Under construction: | | | | | | |
| Cougar | CE | Oregon | South Fork McKenzie | 2 | 25, 000 | |
| Green Peter | CE | do | Middle Santiam | 2 | 80, 000 | |
| Foster | CE | do | South Santiam | 2 | 30, 000 | |
| John Day | CE | Washington-Oregon | Columbia | 10 | 1, 350, 000 | |
| Lower Monumental | CE | Washington | Snake | 3 | 405, 000 | |
| Little Goose | CE | do | do | 3 | 405, 000 | |
| Bruces Eddy | CE | Idaho | North Fork Clearwater | 3 | 300, 000 | |
| Subtotal | | | | | 2, 595, 000 | |

| | | | | | |
|---|---|---|---|---|---|
| Authorized: | | | | | |
| Libby [4] | CE | Montana | Kootenai | 4 | 344, 000 |
| Lower Granite | CE | Washington | Snake | 3 | 405, 000 |
| Asotin | CE | Washington-Idaho | do | 3 | 288, 000 |
| Strube | CE | Oregon | South Fork McKenzie | 1 | 4, 500 |
| American Falls [3] | BR | Idaho | Snake | 3 | 30, 000 |
| Subtotal | | | | | 1, 071, 500 |
| Total, 32 projects | | | | | 10, 319, 650 |

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[1] CE—Corps of Engineers; BR—Bureau of Reclamation.

[2] Nameplate rating.

[3] Incorporated into the U.S. Columbia River Power System by Departmental Order No. 2860 dated May 21, 1963.

[4] Construction of the Libby project is dependent upon ratification of the United States-Canadian treaty relating to development of storage in the Canadian portion of the Columbia River Basin.

TABLE 2—*Pacific Northwest generation: Nameplate rating of plants existing, under construction, and authorized or licensed June 30, 1963*

| Ownership | Existing | | Under construction | | Licensed or authorized | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Number of plants | Nameplate rating | Number of plants | Nameplate rating | Number of plants | Nameplate rating | Number of plants | Nameplate rating |
| Federal: | | | | | | | | |
| Hydro | 24 | 6, 674, 010 | 7 | 2, 595, 000 | 6 | 1, 123, 500 | 37 | 10, 392, 510 |
| Fuel | 1 | 18, 000 | --- | --- | --- | --- | 1 | 18, 000 |
| Total Federal | 25 | 6, 692, 010 | 7 | 2, 595, 000 | 6 | 1, 123, 500 | 38 | 10, 410, 510 |
| Public agencies: | | | | | | | | |
| Hydro | 32 | 2, 948, 080 | 7 | 1, 617, 370 | 2 | 767, 010 | 41 | 5, 332, 460 |
| Fuel | 16 | 188, 370 | 1 | 860, 000 | --- | --- | 17 | 1, 048, 370 |
| Total public agencies | 48 | 3, 136, 450 | 8 | 2, 477, 370 | 2 | 767, 010 | 58 | 6, 380, 830 |
| Private utility: | | | | | | | | |
| Hydro | 89 | 3, 240, 530 | 2 | 616, 950 | --- | --- | 91 | 3, 857, 480 |
| Fuel | 14 | 255, 830 | --- | --- | --- | --- | 14 | 255, 830 |
| Total private utilities | 103 | 3, 496, 360 | 2 | 616, 950 | --- | --- | 105 | 4, 113, 310 |
| Total: | | | | | | | | |
| Hydro | 145 | 12, 862, 620 | 16 | 4, 829, 320 | 7 | 1, 890, 510 | 169 | 19, 582, 450 |
| Fuel | 31 | 462, 200 | 1 | 860, 000 | --- | --- | 32 | 1, 322, 200 |
| | 176 | 13, 324, 820 | 17 | 5, 689, 320 | 7 | 1, 890, 510 | 201 | 20, 904, 650 |

TABLE 3.—*Electric energy account for fiscal year 1963*

| | |
|---|---|
| Energy received (millions of kilowatt-hours): | |
| Energy generated for BPA: | |
| Bureau of Reclamation | 12, 118 |
| Corps of Engineers | 19, 838 |
| Power interchanged in | 13, 754 |
| Total received | 45, 710 |
| Energy delivered (millions of kilowatt-hours): | |
| Sales | 30, 202 |
| Power interchanged out | 13, 583 |
| Used by Administration | 37 |
| Total delivered | 43, 822 |
| Energy losses in transmission and transformation | 1, 888 |
| Losses in percent of total received (percent) | 4. 1 |
| Maximum demand on Federal plants (kilowatts) Jan. 11, 1963, 5–6 p.m., P.s.t | 5, 403, 000 |
| Load factor, total generated for BPA, percent | 67. 5 |

*Percentage distributed by classes of customers for fiscal year 1963:*

| | *Number of customers, June 1963* | *Energy sale by percent of total* |
|---|---|---|
| Publicly owned utilities | 83 | 43. 7 |
| Privately owned utilities | 7 | 11. 3 |
| Aluminum industry | 9 | 30. 3 |
| Other industries and Federal agencies | 19 | 14. 7 |
| Total | 118 | 100. 0 |

TABLE 4.—*Sales of electric energy by classes of customers*

| Class of customer | Fiscal year 1963 | | Fiscal year 1962 | | Percent increase |
|---|---|---|---|---|---|
| | Millions of kilowatt-hours | Mills per kilowatt-hour | Millions of kilowatt-hours | Mills per kilowatt-hour | |
| Publicly owned utilities: | | | | | |
| Firm | 12, 940 | 2. 73 | 12, 133 | 2. 69 | 6. |
| Nonfirm | 274 | 2. 49 | 536 | 2. 50 | −48. |
| Total | 13, 214 | 2. 72 | 12, 669 | 2. 68 | 4. |
| Privately owned utilities: | | | | | |
| Firm | 3, 252 | 2. 11 | 2, 654 | 2. 12 | 22. |
| Nonfirm | 164 | 2. 50 | 541 | 2. 50 | −69. |
| Total | 3, 416 | 2. 13 | 3, 195 | 2. 18 | 6. |
| Aluminum plants: | | | | | |
| Firm | 7, 085 | 2. 03 | 7, 046 | 2. 03 | . |
| Nonfirm | 2, 055 | 1. 81 | 1, 719 | 1. 78 | 19. |
| Total | 9, 140 | 1. 98 | 8, 765 | 1. 98 | 3. |
| Other industries: [1] | | | | | |
| Firm | 4, 033 | 2. 39 | 4, 078 | 2. 31 | −1. |
| Nonfirm | 398 | 2. 26 | 485 | 2. 20 | −18. |
| Total | 4, 431 | 2. 37 | 4, 563 | 2. 30 | −2. |
| Total energy: | | | | | |
| Firm | 27, 310 | 2. 42 | 25, 911 | 2. 39 | 5. |
| Nonfirm | 2, 891 | 1. 97 | 3, 281 | 2. 08 | −12. |
| Total | 30, 201 | 2. 38 | 29, 192 | 2. 36 | 3. |

[1] Includes Federal agencies.

TABLE [illegible].—*Sales of energy, firm and nonfirm, by class of customer and miscellaneous power revenues*

[Thousands of dollars]

| Class of customer | Fiscal year 1956 | Fiscal year 1957 | Fiscal year 1958 | Fiscal year 1959 | Fiscal year 1960 | Fiscal year 1961 | Fiscal year 1962 | Fiscal year 1963 |
|---|---|---|---|---|---|---|---|---|
| Aluminum industry: | | | | | | | | |
| Firm | $13, 119 | $13, 693 | $13, 980 | $14, 227 | $15, 293 | $14, 978 | $14, 341 | $14, 382 |
| Nonfirm | 6, 979 | 6, 333 | 3, 512 | 2, 384 | 2, 168 | 1, 981 | 3, 042 | 3, 715 |
| Total aluminum | 20, 098 | 20, 026 | 17, 492 | 16, 611 | 17, 461 | 16, 959 | 17, 383 | 18, 097 |
| Trend percentages [1] | 100 | 100 | 87 | 83 | 87 | 84 | 86 | 90 |
| Other industry: | | | | | | | | |
| Firm | 2, 569 | 2, 836 | 3, 006 | 3, 138 | 3, 163 | 3, 205 | 3, 191 | 2, 927 |
| Nonfirm | 1, 313 | 748 | 407 | 680 | 868 | 613 | 855 | 625 |
| Total other industry | 3, 882 | 3, 584 | 3, 413 | 3, 818 | 4, 031 | 3, 818 | 4, 049 | 3, 552 |
| Trend percentages [1] | 100 | 92 | 88 | 98 | 104 | 98 | 104 | 92 |
| Publicly owned utilities: | | | | | | | | |
| Firm | 19, 324 | 21, 384 | 22, 593 | 24, 861 | 28, 304 | 29, 520 | 32, 598 | 35, 466 |
| Nonfirm | 181 | 660 | 981 | 768 | 357 | 583 | 1, 340 | 682 |
| Total publicly owned utilities | 19, 505 | 22, 044 | 23, 574 | 25, 629 | [2] 28, 661 | 30, 103 | 33, 938 | 36, 148 |
| Trend percentages [1] | 100 | 113 | 121 | 131 | 147 | 154 | 174 | 185 |
| Privately owned utilities: | | | | | | | | |
| Firm | 9, 226 | 10, 476 | 11, 526 | 11, 846 | 9, 907 | 8, 338 | 5, 678 | 6, 900 |
| Nonfirm | 2, 773 | 3, 974 | 2, 645 | 2, 552 | 2, 659 | 1, 301 | 1, 536 | 332 |
| Total privately owned utilities | 11, 999 | 14, 450 | 14, 171 | 14, 398 | 12, 566 | 9, 639 | 7, 214 | 7, 232 |
| Trend percentages [1] | 100 | 120 | 118 | 120 | 105 | 80 | 60 | 60 |
| Federal agencies: | | | | | | | | |
| Firm | 4, 253 | 4, 777 | 5, 860 | 6, 015 | 5, 986 | 6, 194 | 6, 217 | 6, 646 |
| Nonfirm | 52 | 90 | 194 | 388 | 239 | 281 | 253 | 303 |
| Total Federal agencies | 4, 305 | 4, 867 | 6, 054 | 6, 403 | [2] 6, 225 | 6, 475 | 6, 470 | 6, 949 |
| Trend percentages [1] | 100 | 113 | 141 | 149 | 145 | 150 | 150 | 161 |
| Total sales of electric energy: | | | | | | | | |
| Firm | 48, 491 | 53, 166 | 56, 965 | 60, 087 | 62, 653 | 62, 235 | 62, 028 | 66, 321 |
| Nonfirm | 11, 298 | 11, 805 | 7, 739 | 6, 772 | 6, 291 | 4, 760 | 7, 026 | 5, 657 |
| Total sales of energy | 59, 789 | 64, 971 | 64, 704 | 66, 859 | 68, 944 | 66, 995 | 69, 054 | 71, 978 |
| Trend percentages [1] | 100 | 109 | 108 | 112 | 115 | 112 | 115 | 120 |
| Miscellaneous power revenues | 1, 045 | 1, 299 | 1, 871 | 1, 615 | 2, 054 | 2, 707 | 5, 129 | 5, 726 |
| Trend percentages [1] | 100 | 124 | 179 | 155 | 197 | 259 | 520 | 548 |
| Total revenues | 60, 834 | 66, 270 | 66, 575 | 68, 474 | 70, 998 | 69, 701 | 74, 183 | 77, 704 |
| Trend percentages [1] | 100 | 109 | 109 | 113 | 117 | 115 | 122 | 128 |

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[1] Fiscal year 1956 base year.

[2] [illegible] Village reclassified from "Federal agency" to "publicly owned utility."

BPA Supervising Safety Officer Merl L. Bassett developed a mechanical man to dem strate safe ways for "Your Back at Work," part of a regional campaign to reduce b injuries.

# Southeastern Power Administration

### Chas. W. Leavy, Administrator

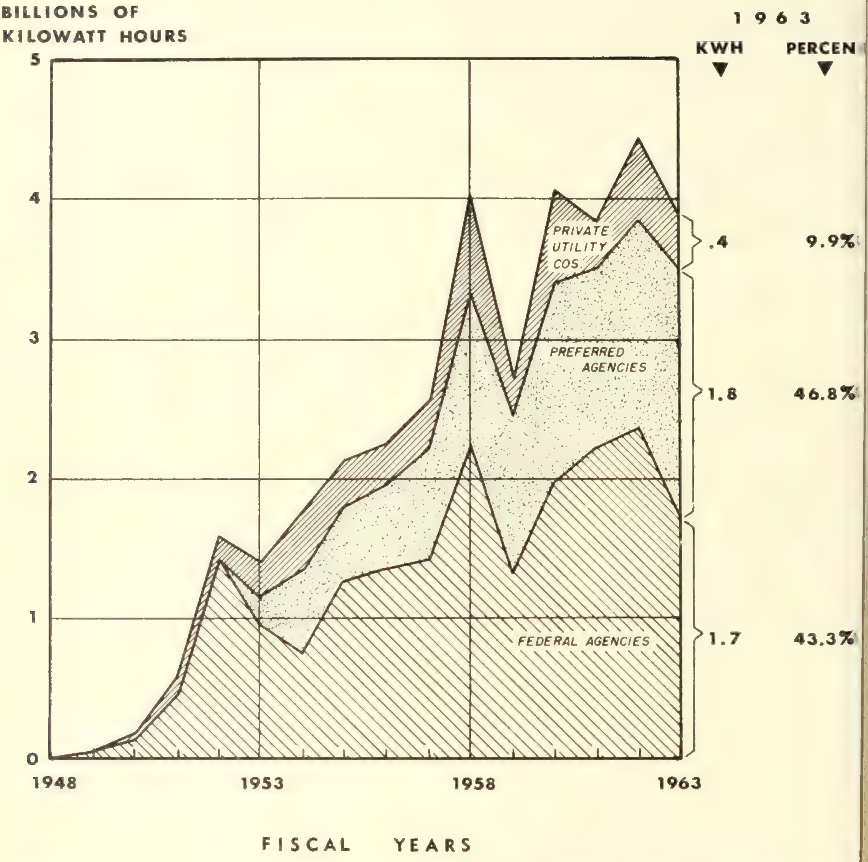
During fiscal 1963, the Southeastern Power Administration marketed 1,507,500 kilowatts of capacity (with peak generation of 1,987,870 kilowatts) and 3,898,394,997 kilowatt-hours of energy. It was sold to 54 public bodies, 75 rural electric cooperatives, 1 Federal agency, and 4 privately owned utilities.

Energy sales during the year earned $22,559,269, compared with $23,211,812 for fiscal 1962, bringing the total revenues earned in all years to $176,752,823.

Electricity marketed by Southeastern Power was generated at 13 Corps of Engineers projects. They were Wolf Creek, Dale Hollow, Center Hill, Old Hickory, and Cheatham Projects in Kentucky and Tennessee; the Allatoona and Buford Projects in Georgia; the Clark Hill and Hartwell Projects in Georgia and South Carolina; the Walter F. George Project in Georgia and Alabama; the Jim Woodruff Project in Florida; and the John H. Kerr and Philpott Projects in Virginia.

The installed generating capacity of 1,612,600 kilowatts included two 32,500-kilowatt units which were placed in commercial operation at Walter F. George Project during the year. Construction by the Corps continued on three projects—Walter F. George in Georgia and Alabama, Hartwell in Georgia and South Carolina, and Barkley in Kentucky. Construction underway will add 281,000 kilowatts of installed capacity.

Output of Wolf Creek, Center Hill, Dale Hollow, Old Hickory, and Cheatham Projects continued to be sold under two contracts with the Tennessee Valley Authority. A third contract with TVA was executed during the year. This provides for delivery of power from the Barkley Project into the TVA system for the retention


Sales of Electric Energy By Class of Customer

of peaking and standby power from the Cumberland system b Southeastern for sale to customers other than TVA, and for change in the terms of the two previously existing contracts.

Output of Philpott and two-thirds of the Kerr Project outpu were sold to the Virginia Electric & Power Co. and 17 cooperative in Virginia and North Carolina; the remainder of the Kerr outpu continued to be sold under long-term contracts to Carolina Powe & Light Co. and 16 public bodies and cooperatives in North Carolin

Part of the Clark Hill Project output was sold to two public bodie in South Carolina. Approximately one-half of the output of th Clark Hill, Hartwell, and Walter F. George Projects, and the outpu

*Southeastern Power Administration: Status of projects*

| Project | State | Plant installations | | | | Generation [2] fiscal year 1963 (M kwh) |
|---|---|---|---|---|---|---|
| | | River basin | Number of units | Total capacity (kw) | Date in service (initial unit) | |
| Existing: | | | | | | |
| Philpott | Virginia | Roanoke | 3 | 14, 000 | September 1953 | 24 |
| John H. Kerr | Virginia-North Carolina | do | 7 | 204, 000 | November 1952 | 411 |
| Hartwell | Georgia-South Carolina | Savannah | 4 | 264, 000 | April 1962 | 445 |
| Clark Hill | do | do | 7 | 280, 000 | January 1953 | 691 |
| Buford | Georgia | Appalachicola | 3 | 86, 000 | June 1957 | 171 |
| Walter F. George | Georgia-Alabama | do | [1] 4 | 130, 000 | March 1963 | 78 |
| Jim Woodruff | Georgia-Florida | do | 3 | 30, 000 | February 1957 | 229 |
| Allatoona | Georgia | Alabama | 3 | 74, 000 | January 1950 | 162 |
| Wolf Creek | Kentucky | Cumberland | 6 | 270, 000 | October 1951 | 773 |
| Dale Hollow | Tennessee | do | 4 | 54, 000 | December 1948 | 100 |
| Center Hill | do | do | 3 | 135, 000 | December 1950 | 304 |
| Old Hickory | do | do | 4 | 100, 000 | April 1957 | 428 |
| Cheatham | do | do | 3 | 36, 000 | November 1959 | 159 |
| Subtotal | | | | 1, 677, 600 | | 3, 975 |
| Under construction: | | | | | | |
| Carters | Georgia | Alabama | 2 | 100, 000 | September 1968 | |
| Millers Ferry | Alabama | do | 3 | 66,000 | December 1967 | |
| Cordell Hull | Tennessee | Cumberland | 3 | 100, 000 | April 1969 | |
| J. Percy Priest | do | do | 1 | 28, 000 | July 1968 | |
| Barkley | Kentucky | do | 4 | 130, 000 | May 1965 | |
| Subtotal | | | | 424, 000 | | |
| Authorized inactive: | | | | | | |
| Salem Church | Virginia | Rappahannock | | 64, 000 | | |
| Gathright-Falling Springs | do | James | | 68, 000 | | |
| West Point | Georgia-Alabama | Appalachicola | | 72, 000 | | |
| Jones Bluff | Alabama | Alabama | | 68, 000 | | |
| Laurel | Kentucky | Cumberland | | 47, 000 | | |
| Subtotal | | | | 319, 000 | | |
| Total, all projects | | | | 2, 420, 600 | | |

[1] 2 units operating and 2 units under construction.
[2] Net generation (M kwh).

of the Allatoona and Buford Projects were sold to Georgia Power Co. and 88 public bodies and cooperatives in Georgia. Power from the George Project was also sold to a generation and transmission cooperative in Alabama.

Output of the Jim Woodruff Project was sold to the Florida Power Corp. and six public bodies and cooperatives in Florida.

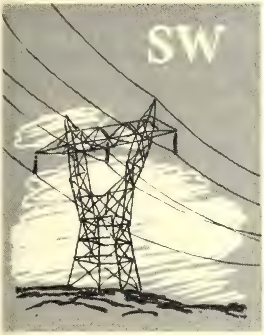
Congress appropriated $350,000 for the fiscal year for headquarters operation and maintenance, and $450,000 for purchasing firming energy and the payment of wheeling fees. Southeastern had 39 employees at year's end.

*Southeastern Power Administration: Comparative statement of revenues and expenses, fiscal years 1962 and 1963*

[Cost basis]

[Rounded to thousands of dollars]

| | Total to June 30, 1963 | Fiscal year 1963 | Fiscal year 1962 | Increase or decrease |
|---|---|---|---|---|
| Operating revenues: Sales of electric energy | $176, 799, 000 | $22, 547, 000 | $23, 206, 000 | ($659, 000) |
| Less revenues allocated to generating projects: | | | | |
| Allatoona | 13, 364, 000 | 1, 333, 000 | 1, 214, 000 | 119, 000 |
| Buford | 8, 836, 000 | 2, 014, 000 | 1, 801, 000 | 213, 000 |
| Clark Hill | 30, 322, 000 | 3, 726, 000 | 3, 778, 000 | (52, 000 |
| Walter F. George | 122, 000 | 122, 000 | | 122, 000 |
| Hartwell | 2, 755, 000 | 2, 670, 000 | 85, 000 | 2, 585, 000 |
| Cheatham | 2, 969, 000 | 796, 000 | 956, 000 | (160, 000 |
| Old Hickory | 9, 645, 000 | 1, 426, 000 | 1, 712, 000 | (286, 000 |
| Jim Woodruff | 7, 061, 000 | 1, 224, 000 | 1, 225, 000 | (1, 000 |
| Center Hill | 14, 406, 000 | 826, 000 | 1, 733, 000 | (907, 000 |
| Dale Hollow | 10, 628, 000 | 553, 000 | 1, 167, 000 | (614, 000 |
| Wolf Creek | 24, 537, 000 | 1, 556, 000 | 3, 251, 000 | (1, 695, 000 |
| John H. Kerr | 28, 984, 000 | 3, 039, 000 | 3, 347, 000 | (308, 000 |
| Philpott | 2, 372, 000 | 333, 000 | 388, 000 | (55, 000 |
| Total revenue allocated to generating projects | 156, 001, 000 | 19, 618, 000 | 20, 657, 000 | (1, 039, 00 |
| Operating revenues available to Southeastern Power Administration | 20, 798, 000 | 2, 929, 000 | 2, 549, 000 | 380, 00 |
| Less operating expenses: | | | | |
| Purchased power | 5, 598, 000 | 552, 000 | 525, 000 | 27, 00 |
| Operation, maintenance, administration, etc | 15, 158, 000 | 2, 304, 000 | 1, 922, 000 | 382, 00 |
| Total operating expenses | 20, 756, 000 | 2, 856, 000 | 2, 447, 000 | 409, 00 |
| Less interest and other deductions: | | | | |
| Interest on Federal investment | 54, 000 | 3, 000 | 4, 000 | (1, 00 |
| Less amount capitalized | 46, 000 | 1, 000 | 2, 000 | (1, 00 |
| Miscellaneous income deductions | (17, 000) | | | |
| Total interest and other deductions | (9, 000) | 2, 000 | 2, 000 | |
| Net available for depreciation | 51, 000 | 71, 000 | 100, 000 | (29, 00 |
| Depreciation | 46, 000 | 5, 000 | 5, 000 | |
| Net revenue | 5, 000 | 66, 000 | 95, 000 | (29, 00 |
| Adjustment of prior years expenses | | (95, 000) | (77, 000) | 18, 00 |
| Net revenue for period | 5, 000 | (29, 000) | 18, 000 | (47, 00 |
| Cumulative net revenue beginning of year | | 34, 000 | 16, 000 | 18, 00 |
| Cumulative net revenue end of year | 5, 000 | 5, 000 | 34, 000 | (29, 00 |



# Southwestern Power Administration

## Douglas G. Wright, Administrator

The Southwestern Power Administration is scheduled to mark its 20th anniversary August 31, 1963. On August 31, 1943, the Secretary of the Interior, by Order No. 1865, created SPA as an agency in the Department to carry out the marketing functions and duties assigned him by Executive Order 9373. Since its creation, SPA has been assigned the power marketing functions of 17 Federal multipurpose projects in the Arkansas, White, Brazos, Red, and Angelina River Basins. Nine of these projects were in operation in fiscal 1963 and eight additional projects were under construction.

For fiscal 1963, Southwestern Power Administration received $1,479,450 by direct appropriation for operation and maintenance and $7,210,000 for construction. An additional $586,100 remained available for completing previously approved construction. Authorization by the Congress made $5 million available from receipts to cover all costs for purchasing power and energy and for renting transmission facilities.

Gross revenues for fiscal 1963 were $17,621,707, an increase of $1,668,315, or 10½ percent, over the gross revenue for fiscal 1962. During 1963, sales to private electric utilities accounted for 32 percent of the revenue dollar; defense industry (aluminum), 12 percent; electric cooperatives, 44 percent; municipalities, 9 percent; and public authorities, 3 percent.

At year's end, the original cost of SPA transmission facilities totaled $30,124,344.

### Marketing

A three-way contract was completed under which firm electric service will be supplied by SPA to the city of Thayer, Mo. The Arkansas-Missouri Power Co. will provide transmission service

TABLE I.—*Southwestern Power Administration: Source and application of funds*

| | June 30, 1962 | June 30, 1963 |
|---|---|---|
| Funds provided: | | |
| Congressional appropriations (net) | $44,745,409.96 | $53,404,763.99 |
| Accountability for transfer of cost or property to or from other Government agencies (net) | 884,456.07 | 1,038,522.32 |
| Gross operating revenue and other income | 116,060,081.78 | 133,785,026.23 |
| Total funds provided | 161,689,947.81 | 188,228,312.54 |
| Funds applied: | | |
| Returned to U.S. Treasury[1] | 45,122,524.95 | 51,147,774.48 |
| Accumulated operating expenses | 93,268,236.58 | 98,840,966.39 |
| Less: Nonfund depreciation and amortization expense | (6,846,809.03) | (7,596,610.82) |
| Electric plant | 28,753,575.60 | 30,124,343.58 |
| Special and trust funds | 5,280,800.49 | 6,867,273.24 |
| Cash | 3,348,076.66 | 9,110,476.63 |
| Accounts receivable | 1,247,567.57 | 1,240,051.92 |
| Other current and accrued assets | 25.00 | 25.00 |
| Material and supplies | 661,375.38 | 690,214.08 |
| Prepayments and advances | 1,048.25 | 1,273.00 |
| Deferred debits | 2,372.27 | 1,914.20 |
| Less: Accrued and other nonfund items | | |
| Accounts payable | (550,633.68) | (751,681.16) |
| Accrued payroll | (26,024.45) | (33,474.22) |
| Accrued leave | (133,581.26) | (146,881.62) |
| Contributions in aid of construction | (65,032.20) | (70,888.56) |
| Accrued interest on invested capital | (8,373,574.32) | (1,196,463.60) |
| Total funds applied | 161,689,947.81 | 188,228,312.54 |

[1] Total funds returned to the U.S. Treasury. No allocation of revenue has been made to the Corps of Engineers to date.

through its system for the city from the point of interconnection between the company and SPA.

Steps were taken to develop standard standby reserve contracts, where appropriate, with preferred customers owning generating facilities. Under such arrangement the customer will receive emergency standby service for some of its plant capability and the Government will receive into its system for the standby pool a block of capacity and energy for schedule and the right to bank energy for future utilization. Negotiations were nearing completion with the city of Springfield, Mo., for the sale of peaking power and energy and the inclusion of such standby provisions.

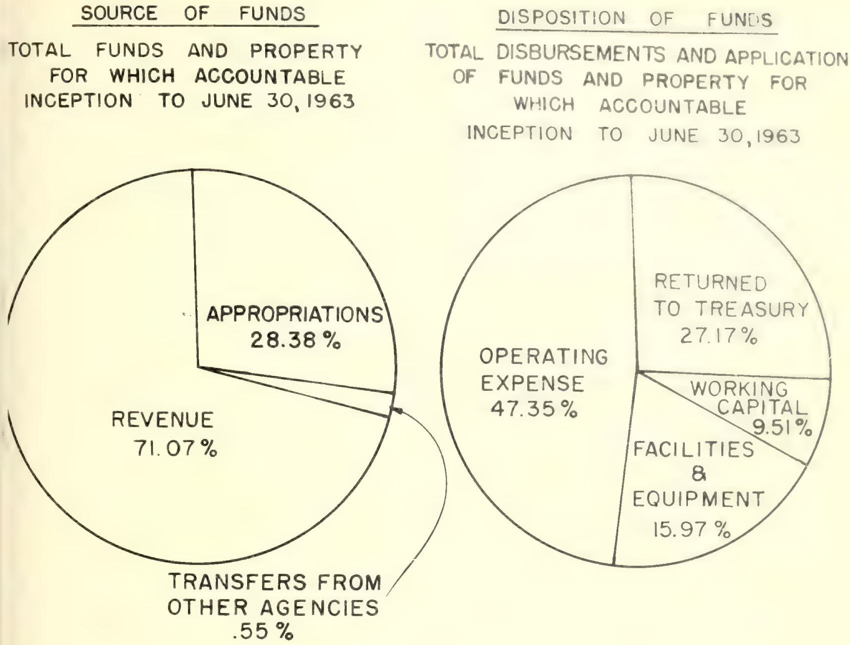


TABLE II.—*Fiscal Operations*

## Sales

Electric power sales in fiscal 1963 increased to 847,406 kilowatts from 689,793 kilowatts in fiscal 1962, a gain of 22.8 percent. Deliveries were made to 31 public bodies, 8 REA electric distribution cooperatives, 9 REA generation and transmission cooperatives, 1 defense industry (aluminum), and 9 private electric utilities. Because of low-water conditions at reservoir projects, there was a notable decrease in secondary energy sales in 1963.

## SPA SALES

| | *Millions of kilowatt-hours* | |
|---|---|---|
| | *Fiscal year 1963* | *Fiscal year 1963* |
| Municipalities | 200.6 | 363.6 |
| REA electric cooperatives | 851.0 | 1,359.5 |
| Public authorities | 76.9 | 69.5 |
| Defense industry (aluminum) | 393.4 | 349.0 |
| Private electric utilities | 234.0 | 125.2 |
| Total | 1,747.0 | [illegible] |

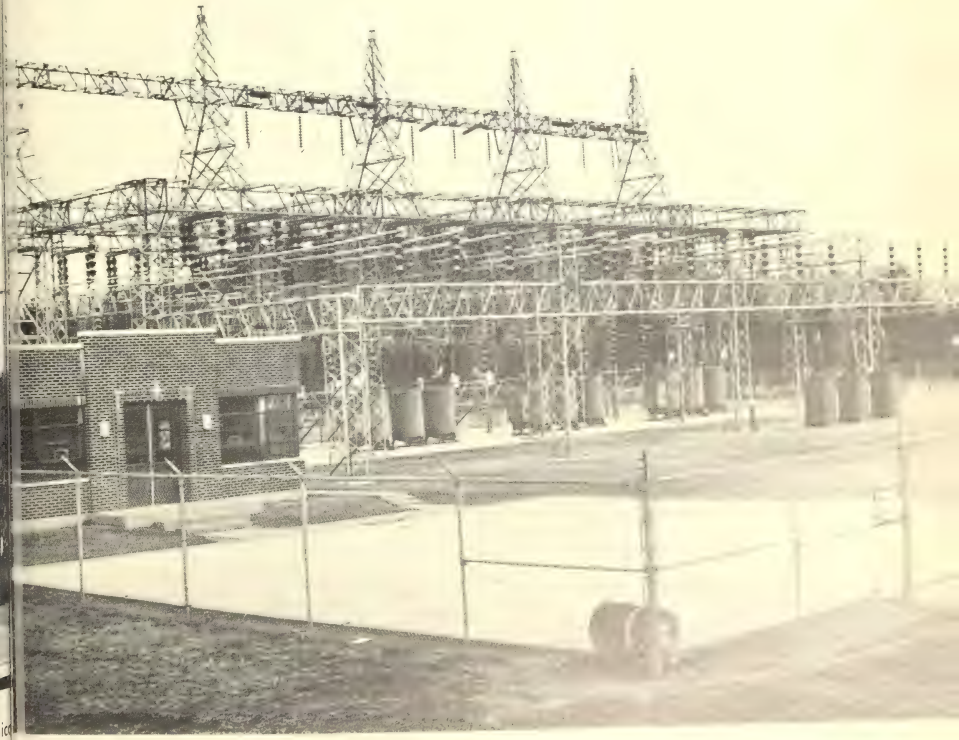
Southwestern Power Administration's "snorkel" truck is an example of efficient applic
tion of the machine for greater manpower utilization.

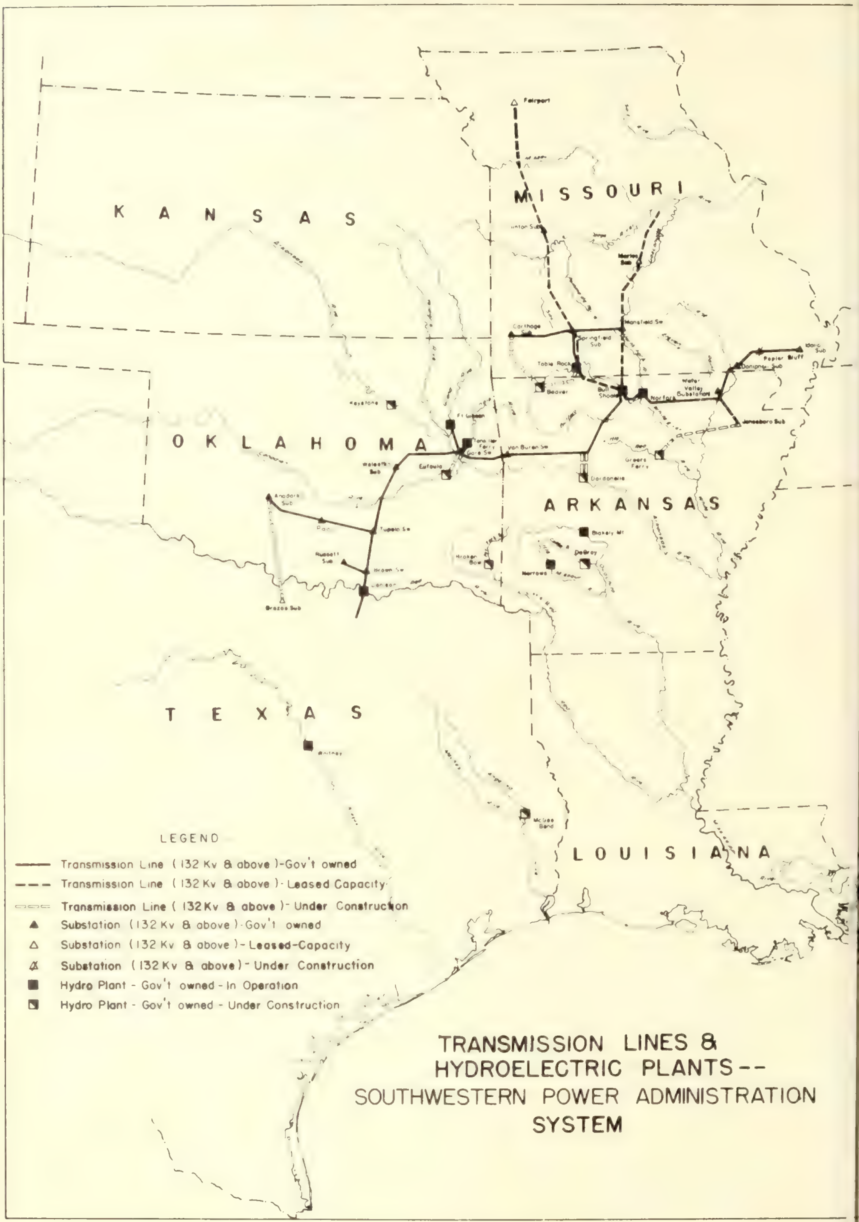
# POWER PRODUCTION

## Resources

Hydroelectric powerplants whose output is marketed by SPA have a total installed capacity of 791,000 kilowatts. The Narrows Project in Arkansas and the Whitney Project in Texas, 17,000 and 30,000 kilowatts, respectively, are not interconnected with remaining projects and their output is marketed separately. The Blakely Mountain Project in Arkansas is integrated with the other projects which are interconnected by contract with the Arkansas Power & Light Co. The installed capacity and current capability of the hydro and steam plants in the system and the schedule of construction are shown in an accompanying table. Location of operating plants and those under construction are shown on an accompanying map.

Van Buren switching station, near Van Buren, Ark., is a key point for future power transormation as power projects are completed in the scheduled development of the Arkansas River basin.





TRANSMISSION LINES & HYDROELECTRIC PLANTS -- SOUTHWESTERN POWER ADMINISTRATION SYSTEM

TABLE III.—*Capability data*

| Project of plant | State | River | Installed capacity | Dependable capacity | Capability June 30, 1963 |
|---|---|---|---|---|---|
| Hydroelectric: | | | | | |
| Interconnected system: | | | | | |
| Bull Shoals | Arkansas | White | 250,000 | 162,000 | 281,000 |
| Denison | Oklahoma-Texas | Red | 70,000 | 54,000 | 80,000 |
| Fort Gibson | Oklahoma | Grand | 45,000 | 45,000 | 48,000 |
| Norfork | Arkansas | White | 70,000 | 56,000 | 80,000 |
| Table Rock | Missouri | do | 200,000 | 138,000 | 230,000 |
| Tenkiller Ferry | Oklahoma | Illinois | 34,000 | 28,000 | 39,000 |
| Subtotal | | | 669,000 | 483,000 | 758,000 |
| Isolated plants: | | | | | |
| Blakely Mountain [1] | Arkansas | Ouachita | 75,000 | 75,000 | 75,000 |
| Narrows | do | Little Missouri | 17,000 | 14,000 | 19,000 |
| Whitney | Texas | Brazos | 30,000 | 24,000 | 28,000 |
| Subtotal | | | 122,000 | 113,000 | 122,000 |
| Total hydroelectric | | | 791,000 | 596,000 | 880,000 |
| Steam: | | | | | |
| Western Farmers Electric Co-op. | Oklahoma | | 30,000 | 31,000 | 31,000 |
| Total steam | | | 30,000 | 31,000 | 31,000 |
| Grand total | | | 821,000 | 627,000 | 911,000 |

[1] By contract.

*Capacities and tentative on-line dates for power generating units in multiple-purpose projects under construction by the Corps of Engineers in the Southwestern Power Administration Area*

| Project | State | River | Number of units | Installed capacity (kw) | On-line date (last unit) |
|---|---|---|---|---|---|
| Eufaula | Oklahoma | Canadian | 3 | 90,000 | November 1694. |
| Bull Shoals | Arkansas | White | [1] 7 and 8 | 90,000 | October 1963. |
| Dardanelle | do | Arkansas | 4 | 124,000 | August 1965. |
| Greers Ferry | do | Little Red | 2 | 96,000 | March 1964. |
| McGee Bend | Texas | Angelina | 2 | 52,000 | June 1965. |
| Beaver | Arkansas | White | 2 | 112,000 | Do. |
| Keystone | Oklahoma | Arkansas | 2 | 70,000 | September 1967. |
| Narrows | Arkansas | Little Missouri | [2] 3 | 8,500 | March 1968. |
| Broken Bow | Oklahoma | Mount Fork | 2 | 85,000 | September 1968. |
| DeGray | Arkansas | Caddo | 2 | 66,000 | May 1969. |

[1] 2 additional units.
[2] 1 additional unit.

## Energy Production

Inflows to the interconnected system projects were approximately 169 percent of median for the first 5 months of the 1963 fiscal year and only 54 percent of median for the last 7 months. Average flow for all fiscal 1963 was approximately 102 percent of median. This is 59 percent of the inflows received by these projects during fiscal 1962. Record, or near-record, drought conditions have existed in the area since December 1962. The reservoir system was 90 percent of full pool at the beginning of fiscal 1963 and was approximately 75 percent full at the end. The total net [illegible]

TABLE IV.—*SPA total system net hydro generation, fiscal years*

[Millions kilowatt-hours]

| Year | Bull Shoals | Denison | Fort Gibson | Norfork | Tenkiller | Table Rock | Interconnected system | Narrows | Blakely Mountain [1] | Whitney | Grand total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1945 | | 101.7 | | 102.6 | | | 204.3 | | | | 204. |
| 1946 | | 244.4 | | 174.9 | | | 419.3 | | | | 419. |
| 1947 | | 247.6 | | 195.8 | | | 443.4 | | | | 443. |
| 1948 | | 165.6 | | 142.0 | | | 307.6 | | | | 307. |
| 1949 | | 165.4 | | 185.4 | | | 350.8 | | | | 350. |
| 1950 | | 174.3 | | 265.9 | | | 440.2 | 3.1 | | | 443. |
| 1951 | | 254.6 | | 207.6 | | | 462.2 | 29.4 | | | 491. |
| 1952 | | 142.6 | | 338.9 | | | 481.5 | 42.5 | | | 524. |
| 1953 | 270.2 | 92.4 | 32.1 | 126.8 | | | 521.5 | 47.4 | | 0.4 | 563. |
| 1954 | 334.7 | 192.4 | 39.5 | 132.8 | 43.3 | | 742.7 | 17.8 | | 20.2 | 780. |
| 1955 | 241.1 | 140.2 | 70.7 | 23.7 | 54.6 | | 530.3 | 29.2 | | 30.1 | 589. |
| 1956 | 386.6 | 197.0 | 74.8 | 105.5 | 38.4 | | 802.3 | 21.2 | 66.1 | 48.6 | 938. |
| 1957 | 651.5 | 144.5 | 72.6 | 204.3 | 61.9 | | 1,134.8 | 39.8 | 219.3 | 71.2 | 1,465. |
| 1958 | 991.7 | 245.4 | 146.7 | 248.2 | 118.0 | | 1,750.0 | 45.8 | 177.0 | 83.2 | 2,056. |
| 1959 | 488.1 | 109.4 | 161.3 | 208.8 | 106.7 | 10.2 | 1,084.5 | 25.2 | 175.8 | 37.7 | 1,323. |
| 1960 | 418.6 | 266.9 | 271.8 | 174.4 | 126.3 | 212.8 | 1,471.2 | 30.4 | 155.6 | 69.4 | 1,726. |
| 1961 | 546.1 | 223.8 | 209.7 | 196.5 | 104.7 | 385.1 | 1,665.5 | 39.8 | 198.9 | 83.0 | 1,987. |
| 1962 | 743.9 | 213.3 | 308.5 | 164.8 | 138.8 | 431.7 | 2,001.0 | 37.7 | 171.6 | 64.3 | 2,274. |
| 1963 | 366.1 | 210.8 | 148.8 | 95.1 | 58.8 | 248.1 | 1,127.7 | 16.1 | 83.4 | 80.3 | 1,307. |
| **Total** | 5,438.6 | 3,532.3 | 1,536.5 | 3,294.0 | 851.5 | 1,287.9 | 15,940.8 | 425.4 | 1,247.7 | 588.4 | 18,202. |

[1] Generation delivered into Arkansas Power & Light Co. system. By contract, 142 million kwh pe year of firm energy is delivered into SPA system.

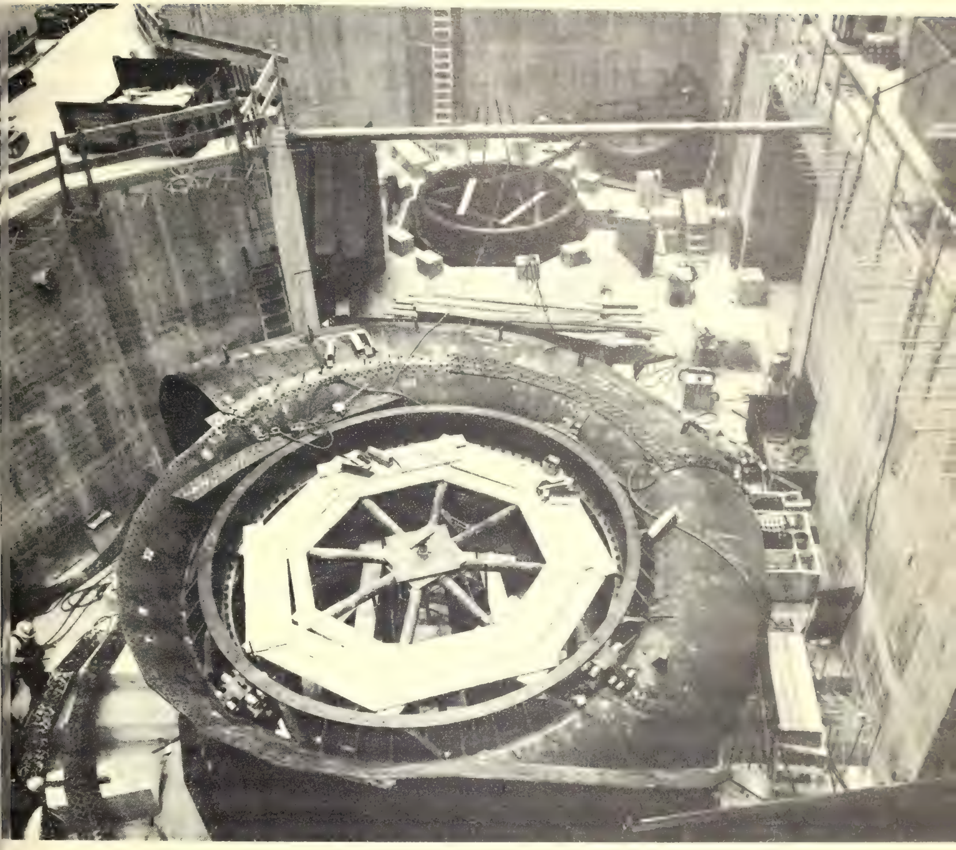
electric generation from all projects during fiscal 1963 was 1,307.5 million kilowatt-hours. Generation, by projects, for the period of operation is shown in a table.

The Missouri Companies and Associated Electric Cooperative contracts were to be effective August 1, 1963; consequently, generation from the Central and N.W. Electric Power Cooperative plants marketed by SPA was 33,117,000 kilowatt-hours for July 1962. The Western Farmers Electric Cooperative plant generated 97,144,500 kilowatt-hours for marketing by SPA during fiscal 1963. In addition to the generation from the hydroelectric and fuel electric plants whose output is marketed by SPA, additional energy totaling 244,548,000 kilowatt-hours was received from other sources for delivery to SPA customers during the year.

# MAJOR PROGRAM ACCOMPLISHMENTS

## Pumped Storage

Cooperative study of two pumped storage projects associated with projects in the Arkansas River navigation system was conducted with the Corps of Engineers. Two 500,000-kilowatt plants are being considered. One would be on Petit Jean Mountain immediately above Lock and Dam 9 on the Arkansas River, which would serve as an afterbay. The other site would be on White Oak Mountain immediately upstream from the Ozark Lock and Dam on the



Installation by the Corps of Engineers of two additional 45,000 kilowatt generators in Bull Shoals Dam on the White River brings the total power at this project to be marketed by Southwestern Power Administration to 340,000 kilowatts.

Arkansas River. Preliminary investigations indicate that these installations would be economically feasible. Studies underway will determine design and operation criteria for the projects. Of particular interest in the studies of these two sites is the optimum utilization of secondary energy from run-of-river plants and other hydroelectric projects for off-peak pumping. This utilization of energy would greatly increase the value of secondary generation from projects in the SPA area.

## SPA–MRB EHV Intertie Investigations

Cooperative studies by the Bureau of Reclamation and SPA are being conducted to determine the feasibility of an extra-high-voltage interconnection between the Missouri River Basin and

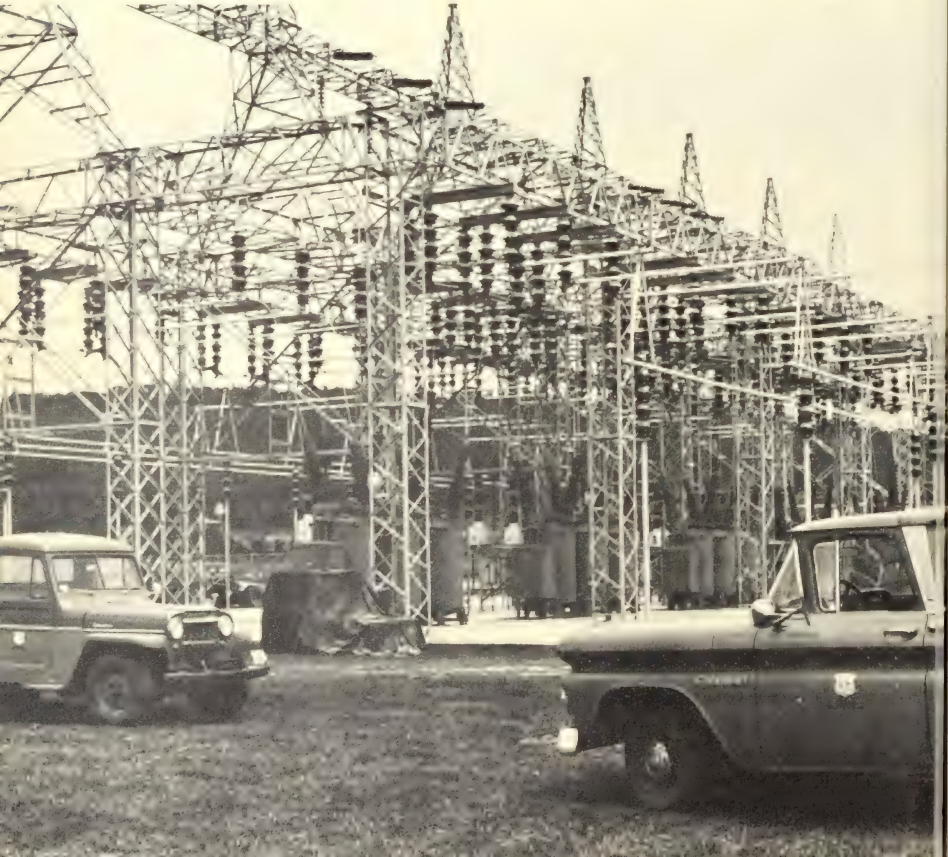
Arkansas River Basin. A report of the study is scheduled to be submitted to the Secretary of the Interior in 1964.

## FUTURE PROGRAM

### Hydroelectric Power Potential Inventory

The inventory of potential hydroelectric power sites, including pumped storage sites, will be extended. The increasing scarcity of conventional, economically feasible hydroelectric power sites lends impetus to investigations of pumped storage sites. Conventional projects under construction in the SPA area will increase its total installed capacity to 1,584,500 kilowatts by 1970. Sites which appear feasible for conventional plants have potential installed capacities totaling 2,980,500 kilowatts, which may be developed by 1980. The total potential of pumped storage which might be eco-

Electric power interconnections, Southwestern Power Administration, such as the Gore, Okla., switching facilities below, bring more effective and efficient power to public, private, and municipal electrical companies and cooperatives.



nomically developed in the SPA area is tremendous, but sufficient data are not available for an accurate estimate of that potential capacity. Three to five million kilowatts in only four or five sites could be developed before 1980. Study of these sites and their development costs is going forward. Collection of data on costs and engineering problems encountered in developing pumped storage plants in the United States and abroad is continuing.

## Expanded Study of System Operational Procedures

The capacity to be available from projects under construction and potential sites considered feasible by 1980, has created the need for broader studies of operating procedures for a large system. Much investigation must be made to provide SPA with criteria for optimum integration of pumped storage and conventional hydro installation into the agency loads. Probability of flow and pool elevation occurrence, as well as determination of guide curves for different conditions, are included in this expanded investigation. Primary effort will be directed at determining the hydraulic diversity among the hydro plants of the interconnected system and the diversity of expected loads.

Southwestern Power Administration employees are shown using the IBM 1620 model computer for development of information on generation and transmission planning and projection of marketing programs.

# DATA-PROCESSING ACTIVITIES

Southwestern Power Administration now has a computer used prinicpally as a tool for developing information regarding generation and transmission planning and for developing marketing programs. Major areas of use are: (1) hydraulic engineering—for synthetic reservoir operation; (2) power marketing and planning—for projecting existing loads, developing load growth trends, and application of future generation to the projected loads; and (3) electrical engineering—for synthetic operation of transmission lines and systems, which are encompassed in a geographic area composed generally of Arkansas, the major part of Oklahoma, Missouri, and Louisiana, and a portion of Texas and Kansas. The computer is being modified to increase its capabilities.

# Office of Saline Water

## C. F. MacGowan, Director

The Administration's desire to develop low-cost processes for desalting water was emphasized by marshaling the Department's technical resources to the task. The goal: more economical ways to produce fresh water from the sea and from brackish water. Agencies enlisted to assist the Office of Saline Water in various phases of research and development activity or the utilization of desalted water included the Bureau of Reclamation, the Bureau of Mines, the Geological Survey, the Office of Coal Research, and the Office of Oil and Gas.

During fiscal 1963, fresh water from ocean water moved toward economic practicality. On May 28, the Department reported to the Key West Aqueduct Commission and other interested Florida officials that a preliminary survey of the feasibility of locating a 6- to 8-million-gallons-per-day conversion plant in Key West indicated a product water cost of 65 to 70 cents per 1,000 gallons, compared with $1 to $1.05 for fresh water delivered from a new aqueduct of equal size.

The Department proceeded with plans to request congressional approval for participation in construction of such a desalting plant which would be combined with a thermal electric generating plant. The Atomic Energy Commission, in cooperation with the Department, was studying the possibility of constructing an atomic reactor as the power source for the combination plant.

Earlier in the year, at a hearing before the Interior and Insular Affairs Committee of the House of Representatives, the Department described progress of the Office of Saline Water. On the basis of then-present information, there was outlined some of the water desalting costs the Department expects to attain.

The committee was told that the Department's two largest plants, the one in Freeport, Tex., and the one at San Diego, Calif., both having a 1-million-gallons-per-day capacity, were producing fresh water from sea water for $1 to $1.25 per 1,000 gallons. By increasing the size of conversion plants to 25 to 30 million gallons per day, with known processes, the cost of water can be reduced to about 50 cents per 1,000 gallons.

The committee also was told of the Department's studies of the economic potential of combining water desalting plants with thermal electric plants. A 10-million-gallons-per-day water conversion plant combined with a 50,000-kilowatt plant, using fuel cost of 10 cents per million Btu's, would produce electric power for 5¼ mills per kilowatt-hour and fresh water for 30 cents per 1,000 gallons. A larger thermal-electric plant, designed to produce 120,000 kilowatts of power, could be combined with a water conversion plant of 25 million gallons per day, again using fuel costs at 10 cents per million Btu's, would produce power for 4½ mills per kilowatt-hour and fresh water for approximately 25 cents per 1,000 gallons.

Research, development, and construction responsibilities of the Office of Saline Water are assigned respectively to the Division of Research, the Division of Processes Development, and the Demonstration Plants Division. Under the Anderson-Aspinall Act (Public Law 87–295), activities of the Research and Processes Development Divisions were expanded and accelerated during the year. Progress made it increasingly clear that the gap between the cost of water production from saline plants and the conventional methods for municipal and industrial uses was closing rapidly.

## DIVISION OF RESEARCH PROGRESSES

The primary objective of the Division of Research is to increase knowledge and understanding in scientific fields regarding the recovery of pure water and valuable byproducts from saline waters. The Division conducted exploratory research to support programs of the Processes and Demonstration Divisions. Further, it maintained liaison with the scientific community and other agencies to insure that significant advances in improving water resources and obtaining minerals from saline water were integrated with Department interests.

The scope of the program was broad and encompasses the following research categories:

### Properties of Water and Solutions Studied

The Division of Research continued its quest of a comprehensive theoretical understanding of water and its solutions. This included investigations in the following areas concerning recovery of water: ions, aqueous systems, chelates, hydrates, crystalline and polymeric materials, and the chemistry and kinetics of water systems.

### Less Costly Separation Processes Sought

Further rapid reduction in costs of pure water from saline sources requires new approaches that are not incremental improvements on present processes. These approaches require new scientific information and understanding. Division of Research activities on separation processes were concerned with new concepts and ideas that are generally applicable to any process of saline water conversion. These involved studies of fundamental concepts in all relevant areas of science and engineering.

There was good reason to believe that the basic research program underway in fiscal 1963 could lead to the practical development of low-cost desalination processes, because nearly all the present processes require more than 30 times the minimum theoretical energy for completely reversible separation. Specifically, studies on the thermodynamics, electrochemistry, phase and chemical equilibria, and mass and energy transport in both physical and biological systems were conducted.

### Interactions at Boundaries of Water Systems

The Division studied the theory of the liquid state and gas, liquid, and solid-phase transitions. Special emphasis was on physical and chemical processes on surfaces and at interfaces. Studies on colloidal systems and adsorption were included. Specific investigations concerned corrosion, transference across phase boundaries, and materials.

### Economic Research Important

The Division's economic research program is designed to predict where in the United States, when, and to what extent unlimited quantities of sea water and considerable reserves of brackish water can be tapped profitably by desalination processes to meet growing fresh water requirements. Studies will include an analysis of economic, geologic, geographic, demographic, and other factors influencing the supply of and demand for potable water in the coming decades. And since the prospects of demineralization are highly cost sensitive, pertinent cost determinations will be an integral part of such investigations.

During the past year, in studies to learn the conditions for minimum temperature and pressure losses in evaporation and condensation, particularly with relatively old surfaces, a new general property of liquids was explained: the formation of floating drops or boules on superheated liquids. The separation of potable water from salt solutions by reverse osmosis was investigated. Pressure desalination by using cellulose acetate membranes was shown to have a most promising future.

## PROCESSES DEVELOPMENT ADVANCES

The Division of Processes Development is engaged in applied research activities. It develops practical uses of scientific knowledge for application to the production of devices, systems, materials, or processes for converting saline water to fresh water at low cost. It is responsible for translating research data and results into bench-scale equipment, pilot units, and complete pilot plants.

Under the processes development program, pilot plant and other studies were conducted on distillation, electrodialysis, and freezing processes prior to their selection for demonstration plants. Applied research was directed toward lowering the three main categories of water costs: capital, equipment maintenance, and energy.

Processes development emphasized the major process groups of distillation, membranes, freezing, hydrates, humidification, and solvent extraction. Research and development was conducted by laboratory projects, pilot plant operations, testing of prototype units, and a variety of applied research related to the various processes, such as heat transfer, scale prevention, and byproduct recovery.

### Distillation Processes Reviewed

The Branch of Distillation investigated several distillation processes having promise for saline water conversion. Although these processes have been under development far longer than other processes, their full potential is yet to be realized. Distillation provides the principal commercial method for obtaining fresh water from sea water. One of the characteristics of distillation technology is the wide variety of designs and cycles employed. Much new research was directed toward improvements in multistage flash design, liquid-liquid heat exchanger, vapor-reheat, thin films, and secondary heat transfer media. A 37,000-gallons-per-day thin-film pilot plant is now in operation at the Research and Development Test Station, Wrightsville Beach, N.C.

Scale formation is still a principal problem in distillation processes. Although various procedures have been employed to prevent scale, and others are now under development, the effects on the process efficiency and design are so important that continued development of improved scale prevention is necessary. Effective and economical means of scale prevention will conserve heat and permit greater economy and efficiency through higher temperature operation and higher brine concentrations.

Control of both calcium sulfate and alkaline scales through internal stabilization or sludge recirculation continued during the year with a forced circulation evaporator, an experimental multistage flash evaporator, and the modified pilot plant equipment used originally for the LTV process. Additives for scale prevention and ion exchange softening, in which the waste brine concentrate is used to regenerate the ion exchange resin, was also under study. The development of these procedures has progressed to the point where both ion exchange and sludge recirculation are being used as methods for scale prevention in the Roswell, N. Mex., demonstration plant.

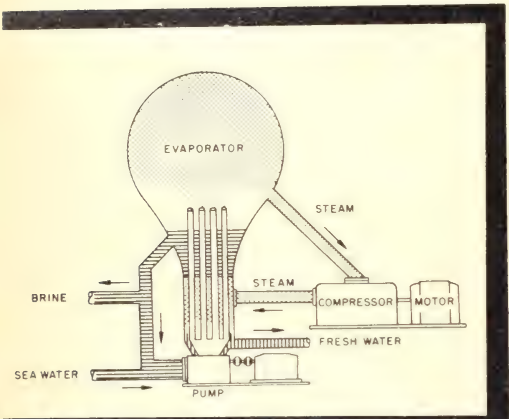
Tests were conducted on the use of acid for preventing scale in multistage flash plants. Tests indicate that this method will be effective in plants operating at much higher temperatures than now possible.

## Heat Transfer Studies Seek Lower Costs

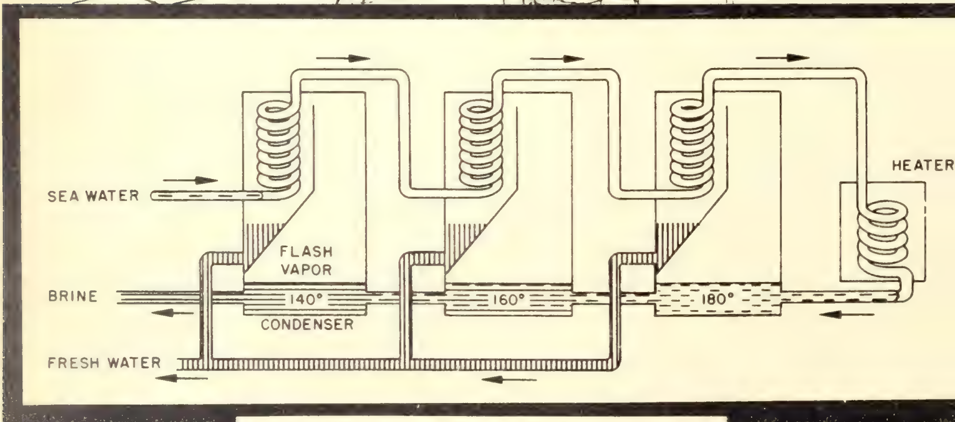
The Branch of Heat Transfer is concerned with the efficient transmission of heat. Research was conducted on the use of dropwise promoting coatings, such as copper and silver sulfides on base metals and on admiralty, copper-nickel, and aluminum brass. If dropwise condensation of steam can be accomplished, the overall heat transfer will be increased substantially, thus decreasing both the energy and heat transfer surface required in a plant. A study was underway on the use of electrical fields to improve liquid-liquid heat transfer.

This branch also conducted preliminary studies on the development of a mobile desalting unit.

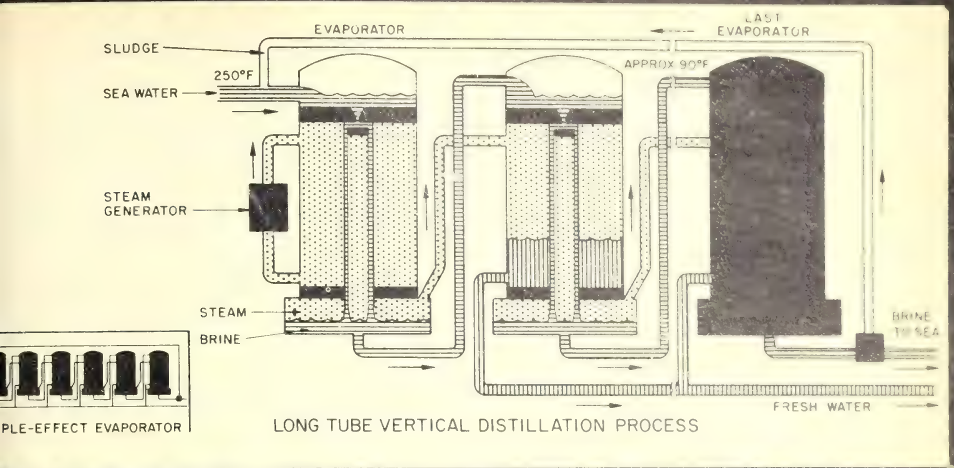
# Some Typical Saline Water Conversion Processes



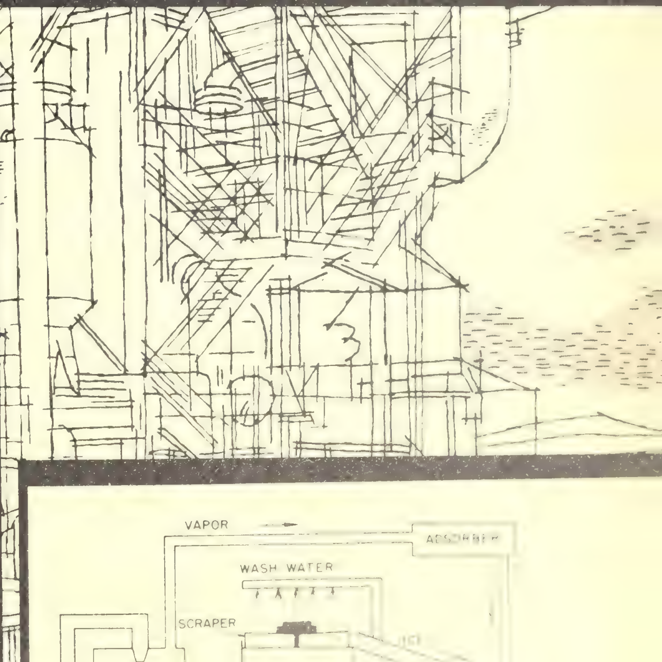
**FORCED-CIRCULATION VAPOR-COMPRESSION**

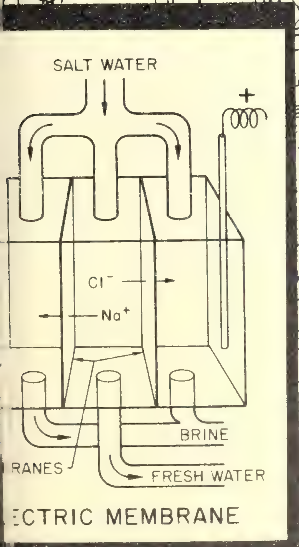


**MULTISTAGE FLASH DISTILLATION**

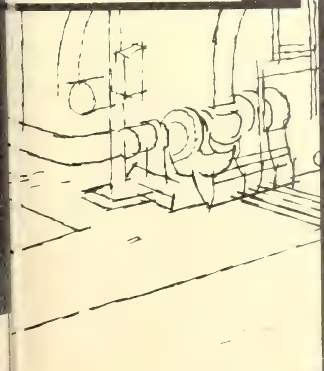


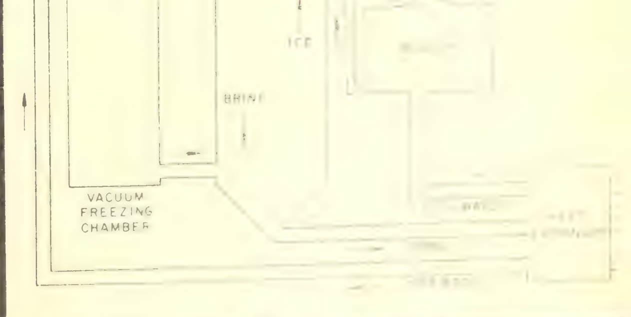
# LONG TUBE-VERTICAL (LTV) MULTIPLE EFFECT DISTILLATION PROCESS





# LECTRODIALYSIS





# FREEZING

## Membrane and Ion Exchange Explored

The Branch of Membrane Processes continued the development of the two major membrane conversion methods: electrodialysis and reverse osmosis. Electrodialysis is one of the leading methods for converting brackish waters and is further advanced in its development than reverse osmosis; however, rapid progress was made during the year in developing the reverse osmosis method. Membrane processes have their greatest promise in the conversion of brackish waters because the amount of current for electrodialysis and the amount of pressure for reverse osmosis increase with the concentration of salts to be separated.

A general program of electrodialysis process studies continued for the purpose of evaluating current developments, improving process operations, and guiding future development work. Much of the work was at Bureau of Reclamation laboratories in Denver, Colo., under a program supported by the Office of Saline Water. A brackish water well of about 3,400 parts per million salinity was available for the test work. Studies covered evaluation of commercial membranes and cell designs, preparation of a laboratory membrane test manual, the effect of water composition, and polarization problems.

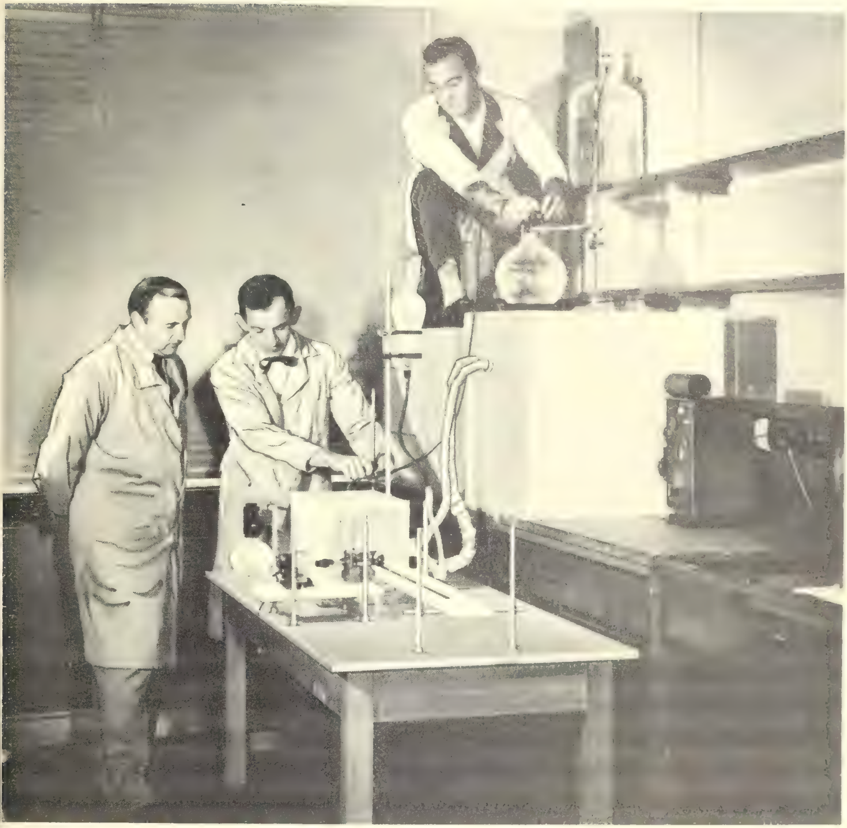
In reverse osmosis, extensive laboratory research has been sponsored by the Division of Research on the basic characteristics of the reverse osmosis membranes. Results of this work justified an initial pilot plant on the process and a 1,000-gallons-per-day unit has been built. Testing with sea and brackish water are planned for fiscal 1964.

Possibilities for economical conversion by the conventional ion exchange procedures depend on recovering the regenerants. A limited laboratory study was conducted on the use of carbon dioxide as a recoverable regenerant.

## Many Special Projects Undertaken

The Branch of Special Projects is conducting research and development on processes not covered by the other branches. Major areas to which emphasis was directed in fiscal 1963 were freezing, hydration, humidification, and solvent extraction.

Freezing of saline solutions results in the formation of pure water ice crystals which, after separation from the mother-liquor, may be melted to fresh water. This principle forms the basis for two direct freezing processes: the first uses flash evaporation of precooled sea water, the vapor being absorbed by a chemical ab-



Basic research in saline water conversion entails many laboratory investigations to develop new knowledge that may lead to new or improved desalination processes.

sorbent; and the second involves the flashing of a hydrocarbon refrigerant in direct contact with precooled sea water. The resulting ice crystals are washed free of brine and melted either by the heat of absorption or by the condensation of refrigerant vapors.

The feasibility of flash evaporation was studied in a 15,000-gallons-per-day pilot plant at Wrightsville Beach, and the resulting data were used to prepare a design of a 165,000-gallons-per-day plant. The second type of freezing process uses a secondary refrigerant and is being evaluated in a pilot plant initially designed to produce 35,000 gallons per day. Modifications to the pilot plant ncreased daily production to 54,000 gallons. The process will also be tested in a 200,000-gallons-per-day pilot plant which will differ from the smaller one in that the evaporation of the refrigerant is specifically controlled to induce large crystal growth and thus facilitate separation of ice-brine mixtures by a centrifuge. These pilot plants will provide facts needed for large freezing plants.

The hydrate process underwent considerable development at the bench-scale level and was ready for evaluation in pilot plants. Two units were in the design stage and will be built in the near future at Wrightsville Beach. They will use propane as the hydrate former, but will feature different wash-separation methods. Since the density of the hydrate crystal is less than that of ice, separation has been created experimentally by cyclones.

Use of liquid-liquid extraction for saline water conversion has been shown to be theoretically feasible and potentially practical, especially for brackish waters in the range of 5,000 to 10,000 parts per million total solids. The process is based on the principle that fresh water is extracted from saline solution by an organic solvent or mixture of solvents to form a separate phase from which fresh water is recovered by a moderate increase in temperature. A pilot unit of 2,000-gallons-per-day capacity has been designed and built.

A reduction of about 50 percent in construction costs of glass covers for basin-type solar stills at the Daytona Beach site resulted by using standard-size single-strength glass and better sealing techniques. Tests showed that butyl rubber has great promise as a basin liner. Continued studies based on a humidification process using solar energy for heating, separate condensers, and packed column evaporators led to construction of a small pilot plant in Sonora, Mexico, to determine the economics of this system.

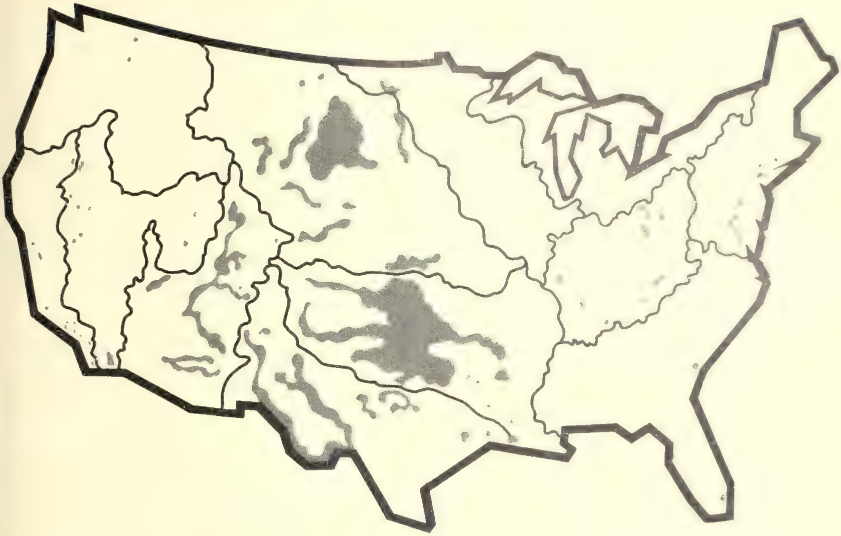
## Engineering Analysis and Evaluation Important

The Branch of Engineering Analysis and Evaluation is conducting studies on byproduct recovery, preparing an engineering data book, and is responsible for coordinating development activities at the Research and Development Test Station at Wrightsville Beach.

Studies were made to determine to what extent the recovery of salable byproducts from saline water effluents offers a practical way to reduce costs of saline water conversion. A uniform and objective method of comparative engineering analysis applicable to various processes also is being developed.

## Research and Development Test Station Constructed

One of the major projects of the Office of Saline Water during fiscal 1963 was construction of a Sea Water Conversion Research and Development Test Station at Wrightsville Beach. The station is on a portion of a 25-acre tract of property donated to the Department of the Interior by the State of North Carolina. It wil



As part of its research and development activities, the Office of Saline Water has conducted a preliminary survey of the brackish water inland resources of the United States to discover new water supplies. Shaded areas on the above map indicate sources of brackish water from the preliminary survey.

provide a central location for the operation, evaluation, and further development of various conversion processes.

Facilities at the test station include reinforced-concrete slab areas for the erection of as many as nine experimental pilot plans, utilities, maintenance and administrative services, and other necessary equipment for research and development. At year's end, six experimental units for testing or developing different processes or process improvements were under construction.

## DEMONSTRATION PLANTS

Demonstration plants authorized under Public Law 85–883 are programed as follows:

| | |
|---|---|
| **Long tube vertical multiple-effect distillation** | Freeport, Tex. |
| **Multistage flash distillation** | San Diego, Calif. |
| **Electrodialysis** | Webster, S. Dak. |
| **Forced circulation** | Roswell, N. Mex. |

The million-gallons-per-day saline water conversion plant at Freeport, after recovering from effects of Hurricane Carla in 1961, has since been in almost constant operation. The material testing and evaluation program established the fact that carbon steel tubing is not durable for this type of process. As a result all such metal in the long tube vertical multieffect evaporators and heat exchangers was replaced with aluminum brass.

The 250,000-gallons-per-day demonstration plant designed to desalt the brackish water of Webster, S. Dak., established an excellent operations record. The plant utilizes a membrane process to reduce the salinity of brackish well water from approximately 1,800 dissolved parts of salt per million parts of water (ppm) to less than 275 ppm. As a result of improved instrumentation and perfection of current-reversing pulsation which helps eliminate polarization of the membranes by permitting higher current density, the plant was able to maintain unattended operation on the daily third shift.

The million-gallons-per-day multistage flash distillation plant at Point Loma, near San Diego, Calif., was able to produce 40 percent over design capacity at higher operating temperatures (240°–

Secretary Udall dedicated the new Department of the Interior saline water conversio
plant at Roswell, N. Mex., in July 1963, which will convert brackish water to fresh
supplement the supplies of the city of Roswell.

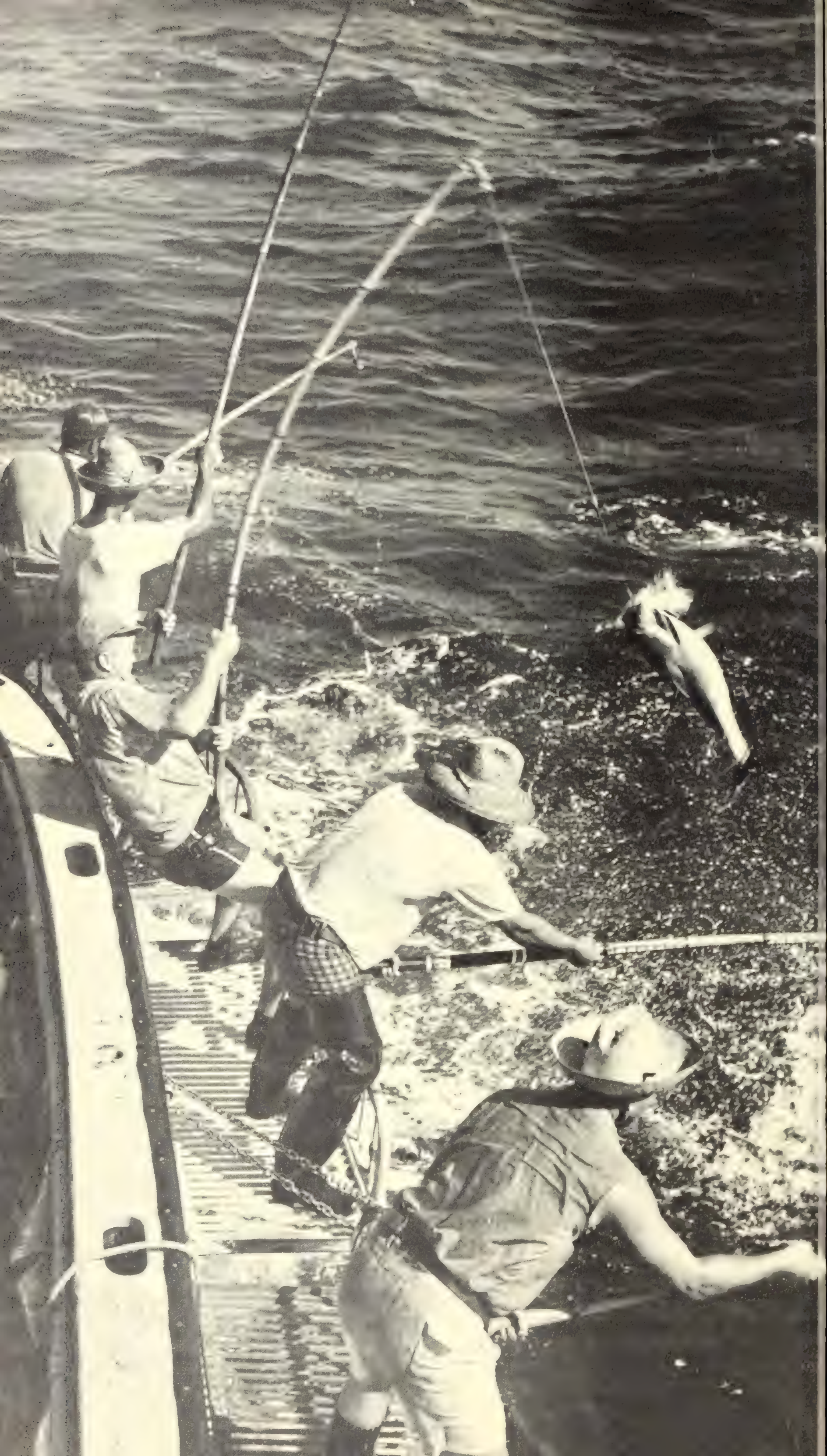
250° F) utilizing the pH technique. This plant has been plagued by seaweed which hampers efficient operation of the intake system. Construction improvements were started, following an engineering study, to redesign and revamp the intake complex before testing the slurry technique of scale prevention at higher temperatures (250°–350° F).

Two giant vapor domes, rising 92 feet above the barren New Mexico landscape near Roswell, are the dominant feature of the largest brackish water conversion plant in the United States. It is the fourth large plant built by the Department of the Interior as part of its continuing effort to develop low-cost desalting processes.

More than 1,000 spectators, including several Members of the Congress, State and local officials were present July 1, 1963, when Secretary Udall placed the new plant in operation. It is designed to produce fresh water from presently unusable brackish well water at the rate of a million gallons per day. While the plant was built primarily to advance saline water conversion technology, it also provides the city of Roswell with water to supplement limited sources of natural fresh water.

# Office of the Assistant Secretary for Fish and Wildlife

Frank P. Briggs, Assistant Secretary



# Office of the Assistant Secretary for Fish and Wildlife

## Frank P. Briggs, Assistant Secretary

The Department of the Interior is active in many fish and wildlife conservation programs, national as well as international in scope.

The Assistant Secretary for Fish and Wildlife represents the Secretary of the Interior in carrying out these programs and in establishing policies of the Fish and Wildlife Service.

Much of the Assistant Secretary's time was devoted to problems dealing with migratory waterfowl. A U.S. delegation, with the Assistant Secretary serving as chairman and consisting of two representatives from the Department of the Interior and two from the Department of Agriculture, met with the representatives of the Canadian Government to plan and execute proposals for improving waterfowl nesting and rearing habitat.

The Assistant Secretary was active in the battle to save the prairie potholes in the United States from agricultural drainage. These potholes are important waterfowl nesting sites. While the movement to purchase and lease existing potholes has been deterred in some States by the lack of "in lieu" tax legislation, considerable progress was made in fiscal 1963 in the campaign.

The pollution of lakes and streams is having a serious effect on the Nation's fish and wildlife resources, and pollution abatement is rapidly becoming another important program of the Department of the Interior. The Assistant Secretary for Fish and Wildlife recently joined officials of the Department of Health, Education, and Welfare and the Army Corps of Engineers in a conference with Governors of Minnesota and Wisconsin to work out antipollution plans for the Upper Mississippi River.

These Hawaiian fishermen use the pole method to catch tuna from the [illegible]

The widespread use of chemical pesticides and their effects on fish and wildlife species represents a major threat to these living resources. Because of its position of leadership in wildlife-pesticide research, the Fish and Wildlife Service has expanded its facilities in an effort to keep abreast of the extremely rapid development of new and deadly chemicals.

The Fish and Wildlife Service's Bureau of Sport Fisheries and Wildlife established a new wildlife-pesticide laboratory at the Patuxent Wildlife Research Center near Laurel, Md. This is the first Federal installation built specifically for such studies. With this new laboratory, the Nation has, for the first time since the use of pesticides became a major factor in agriculture, a research facility designed to determine ways and means of using chemicals to protect agricultural crops without sacrificing fish and wildlife.

Increased interest in the sea and accelerated utilization of its products are creating new and more complex problems for the Assistant Secretary for Fish and Wildlife. Fishing fleets from other countries operate near U.S. shores and in some cases compete directly with American fishermen. In an effort to find untapped resources of the sea, interagency oceanography work was increased during the year, but more intensive research still is needed to solve many of the riddles of the "deep frontier."

The National Fisheries Center and Aquarium moved nearer to reality with the appointment of an Advisory Board to determine the policies of the new installation. The Assistant Secretary is an ex officio member of this Board. The Advisory Board recommended to the Secretary of the Interior that the new research and educational facility be located on Hains Point in Washington, D.C.

Better coordination between the Secretary of the Interior and the component bureaus of the Fish and Wildlife Service was achieved during the past year by closer liaison through the office of the Assistant Secretary. Critical problems were quickly brought to the attention of the Secretary and policy decisions were made available to the bureaus in record time.

# Fish and Wildlife Service

## Clarence F. Pautzke, Commissioner

The Fish and Wildlife Service is administered by the Commissioner of Fish and Wildlife, under supervision of the Assistant Secretary for Fish and Wildlife.

The Commissioner directs and coordinates the policies and programs of the Service's two bureaus—the Bureau of Sport Fisheries and Wildlife and the Bureau of Commercial Fisheries. His contact with Bureau operations on both the national and international level is through the Directors of each of the two Bureaus and through staff assistants for legislation, program review, international relations, and conservation education.

The Office of the Commissioner is vitally concerned with the many international problems affecting fish and wildlife resources. During the past year increased attention was devoted to such problems.

The tremendous growth of foreign fisheries in waters close to the U.S. coast—Soviet fisheries in the North Atlantic and Japanese and Soviet fisheries in the North Pacific off the coast of Alaska—has created difficult problems. Large Soviet fleets now fish on grounds off the coast of New England. In the past, these grounds have been fished almost exclusively by American fishermen, and although the foreign operations have offered little competition for American fishermen for most species, the potential for competition for many species of importance to the American fishermen is great. In the North Pacific and Bering Sea, which until recently was virtually a Canadian-American lake, some 300 to 400 Soviet and Japanese fishing vessels were operating—in some instances competing directly with American fishermen. Conflicts between incompatible forms of gear used in the fisheries of the Northwest Atlantic and the North Pacific have also posed serious problems and have resulted in losses to American fishermen of fishing gear of substantial value. Soviet whaling vessels also appeared off the Washington-Oregon coasts and fishing vessels of the Soviet Union were observed in the conduct of fishing operations off the Middle Atlantic coast and in the Gulf of Mexico.

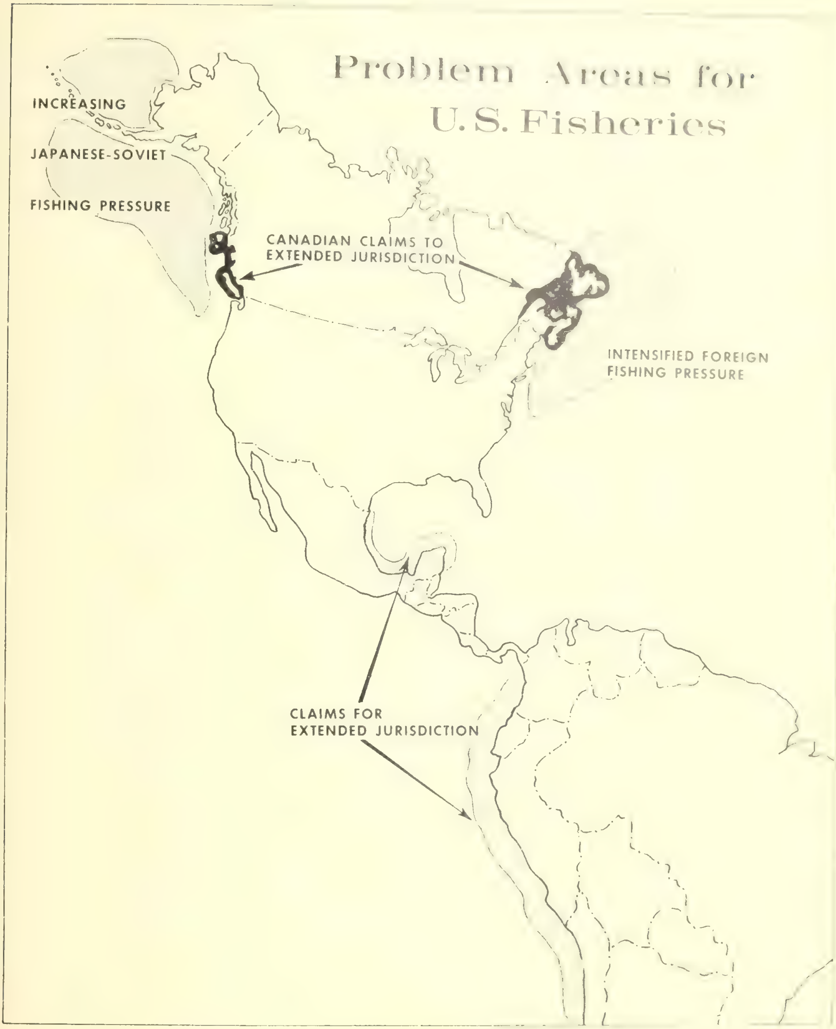
Both to the north and to the south, foreign governments have asserted claims to jurisdiction over fisheries in waters off their coasts beyond the three geographical-mile territorial belt historically recognized by the United States, thereby posing a threat to longstanding U.S. fisheries in those waters. During the year, Canada announced its intention to extend its jurisdiction over fisheries to a 12-mile zone off its coasts. Should this have the effect of excluding American fishermen from the zone, the impact on American fisheries would be substantial.

Various governments in Latin America claim jurisdiction over fisheries in extended zones off their coasts. Both the shrimp and tuna industries of the United States are threatened by such claims. During the past year, seizures of vessels by Ecuadorean authorities on the basis of such claims resulted in a major incident and the start of negotiations that were still in progress at year's end. Solving the resulting disputes in a mutually satisfactory way requires long preparation and careful, time-consuming negotiation.

Virtually every important segment of the fishing industry in the United States is affected by the activities of foreign fishermen and the policies of foreign governments regarding fisheries. Foreign fishermen exploiting resources that are harvested by American fishermen present a complicated international conservation problem and also compete with American fishermen for the resource, often with considerable advantage. The products of foreign fisheries compete with the products of American fisheries in both foreign and domestic markets. Foreign governments, in implementing claims to jurisdiction over vast areas of the high seas, threaten to deprive American fishermen of important, traditional fishing areas.

The United States is a member of a number of international fishery commissions aimed at bringing about cooperation in the conservation of resources harvested by the fishermen of many countries. The Commissioner of Fish and Wildlife is a U.S. representative on two of these organizations and his staff provides advice and assistance to officers of the Service who serve on other organizations.

Major accomplishments during the past year in connection with these organizations have been the negotiation of a protocol amending and continuing the convention between the United States, the U.S.S.R., Canada, and Japan for the conservation of the fur seal


Problem Areas for U.S. Fisheries
INCREASING JAPANESE-SOVIET FISHING PRESSURE
CANADIAN CLAIMS TO EXTENDED JURISDICTION
INTENSIFIED FOREIGN FISHING PRESSURE
CLAIMS FOR EXTENDED JURISDICTION

resources of the North Pacific Ocean; and agreement among the 13 member nations of the International Commission for the Northwest Atlantic Fisheries which will eventually bring into force a system of international enforcement of the Commission's conservation regulations.

A major problem, yet unsolved, involves the renegotiation of the convention between Canada, Japan, and the United States for the conservation of the fisheries of the North Pacific Ocean. Renegotiation began with a conference in Washington in June 1963 and was expected to continue for some time.

The development of measures to provide protection to American fishermen in these trouble areas and to anticipate future problems resulting from the growth of foreign fisheries has been and will continue to be a complex task for the Office of the Commissioner.

The wise management of natural resources depends on an informed public. Keeping the public abreast of the latest developments concerning the Nation's migratory bird populations as well as meeting the growing demand for information on the vital pesticide-fish and wildlife problem are only two of the many tasks carried out by the Service's conservation-education program centered in the Office of the Commissioner.

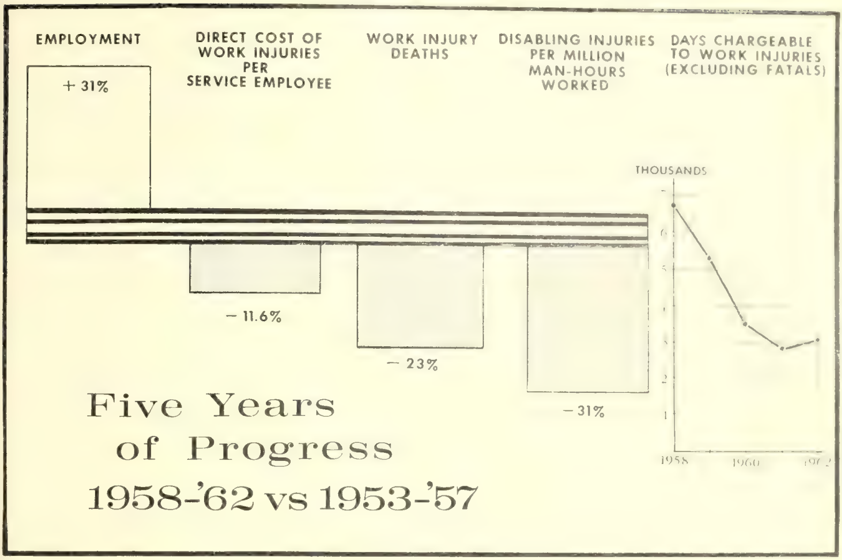
The restrictive duck hunting regulations of the 1962–63 hunting season would probably have been unacceptable to many waterfowl hunters without some explanation of the basic reasons behind the regulations. Various public announcements were used to point out the serious plight of the continent's duck population and to familiarize hunters with the protective regulations.

America's largest and rarest migratory bird, the whooping crane, has for some years been on the brink of extinction. This bird's dramatic fight for survival is of great interest to the conservation-minded public and an educational campaign to provide additional protection for these birds during migration was intensified.

Public awareness of the effects of pesticides on fish and wildlife resources has created new demands for information in this field. An expanded educational program will be necessary to meet the serious threat that the unwise use of pesticides poses for the Nation's wildlife resources.

A vital part of any Government program is the safety of employees. The calendar year of 1962 completed 5 full years of administration of the Service's safety program. Despite rising compensation and medical costs due to inflation and legislation, the estimated direct cost of work injuries, motor vehicle accidents, fires, property damage from accidents, and tort claims for the 5-year period was $321,231. For the calendar year 1962, it was estimated at $106,000. A statistical comparison with the preceding 5-year period, 1953–57, is shown on the following chart.

The safety program gives attention to the safety and health of employees and of the public who use Service facilities. It is concerned with loss reductions and more effective manpower utilization. Employee programs are directed at on- and off-the-job safety. They cover such diverse activities as construction, maintenance, and farming; laboratory analysis and field use of highly toxic chemicals for the control of mammals, birds, fish, insects,



and vegetation; underwater activities with scuba, diving cylinders, small submarines and other devices; the use of electrical fish sampling equipment; fire control; and work with radioactive isotopes as tracers and for irradiation purposes.

More than 11 million visitors used Service facilities during the year. This public use is increasing along with the responsibilities for providing a safe environment for such visitors.

The majority of the activities administered by the Office of the Commissioner are reflected in the accomplishments of the Bureau of Commercial Fisheries and the Bureau of Sport Fisheries and Wildlife. The reports of these two bureaus follow.

# Bureau of Sport Fisheries and Wildlife

## Daniel H. Janzen, Director

Alarm over the hazards of pesticides and other poisons to wildlife resources and to humans as well was a notable development in fiscal 1963. The Department's Bureau of Sport Fisheries and Wildlife has studied the effects of pesticides on wildlife and fish for many years; in the past year such efforts were greatly intensified.

Notable also has been widespread concern over the growing recreational needs of a burgeoning population. Providing recreational fishing and hunting for the greatest number of Americans is an important objective of the Department. Congressional authorization for increased public recreational use of areas managed by the Bureau of Sport Fisheries and Wildlife and additional funds from the Accelerated Public Works program for developing public-use facilities on these areas gave strong assistance to the Department's contributions to public recreation.

A less obvious but still perceptible development of the year was an increasing awareness of the importance of research in determining how to protect, manage, conserve, and use America's fish and wildlife resources. Bureau research in these resources was enhanced by new laboratories and research stations and by new cooperative wildlife research units and cooperative fishery units established at several State universities.

### Pesticides and Wildlife Studied

National awakening to the necessity for safety in pesticide use, highlighted by the President's Science Advisory Committee report, led to new research facilities and expanded studies of pesticide-wildlife relations.

Proper management of fish and wildlife resources enhances recreation opportunity for the sportsman or outdoorsman.

## New Laboratory Dedicated

At the Patuxent (Md.) Wildlife Research Center, April 25, 1963, the Secretary dedicated the Biochemistry and Wildlife Pathology Laboratory, the first Federal installation constructed specifically for research on pesticide-wildlife relations.

"The work done here may prevent or halt the threat of the 'silent springs' that stalk the earth—for this laboratory marks the beginnings of a new national awareness of the present and potential danger we have almost thoughtlessly brought to the world in which we live," the Secretary said.

## Reproduction Rates Affected

Tests at Patuxent showed that reproductive rates in pheasants, quails, and mallards are lowered by pesticides in the food supply. Quantities varying from 10 to 50 percent of the lethal dose of certain pesticides markedly inhibited reproduction and changed coloring of the feathers.

The unknown, but potentially calamitous, chronic effects of pesticides on fishes were under study at Bureau laboratories and field stations. Their effects on future generations of fishes are of special concern. Trout and salmon eggs at various hatcheries were found to contain up to 0.43 parts per million (ppm) DDT and its derivatives. One year after exposure, cutthroat trout contained relatively high residues of DDT, particularly in the brain, although no pathology attributable to the chemical was detected. Work on chronicity of the increasing number of pesticides involved chemical analyses and long-term observations of successive generations of exposed fishes.

## Cumulative Effects Examined

Evidence is increasing that pesticides used in wide-scale pest control are concentrated in sump areas by runoff and irrigation water. Poisoning of pelicans and other fish-eating birds on the Tule Lake National Wildlife Refuge in California indicated that transmission was through aquatic organisms, which showed a progressive increase in pesticide concentration from the lower to the higher animals making up the food chain.

A disconcerting aspect of the pesticide problem is the cumulative deposition of toxins in living animals. Ducks, geese, bald eagles, deer, fish, and other wildlife species are known to hold pesticide residues in their body tissues. Following spraying with DDT for spruce budworm control in Montana, Colorado, and New Mexico, some mule deer killed by hunters showed pesticide levels higher than the 7 ppm prescribed by the Food and Drug Administration as the maximum concentration allowable in meats entering interstate commerce. The longtime effects of these residues on the Nation's wildlife is a matter of vital concern to the Bureau.

## Pollution Problems Combated

Recognizing that land and water must be intensively managed and well protected to provide more fishing and hunting for coming generations, the Bureau studied the control and prevention of various kinds of pollution in aquatic wildlife environments.

Emergency action was required in fiscal 1963 to prevent widespread loss of waterfowl in the Upper Mississippi River Wildlife and Fish Refuge when great volumes of oil entered the Minnesota and Mississippi Rivers at upstream points. The Bureau was concerned also about the pollution-caused losses of fish in the Roanoke River in North Carolina. It also noted unsatisfactory conditions for fish in the lower Delaware River.

Discussions were held with officials of the Bureau of Mines to learn what studies of mutual benefit might be made of acid mine-water drainage into streams, control of oilfield brine pumping, and evaluation of hydrocarbon effects on fishes. The Bureau of Sport Fisheries and Wildlife participated in meetings of the Department's surface mining committee to mitigate destructive effects of strip mining. Every Bureau field installation now has sewage-treatment facilities. No domestic wastes are discharged into local streams or lakes.

In April 1963, Secretary of the Interior Stewart L. Udall dedicated the new Biochemistry and Wildlife Pathology Laboratory at the Patuxent Wildlife Research Center, Laurel, Md. Here the Bureau of Sport Fisheries and Wildlife will increase investigations of wildlife diseases.

Pesticide poisoning of pelicans, bald eagles, and other fish-eating birds from residues in water or transmitted by certain aquatic organisms is a matter of vital concern to the Bureau of Sport Fisheries and Wildlife.

Statements on pollution were prepared for the many congressional committees studying contamination of air and water. A member of the Bureau's staff was a member of the Ohio River Valley Water Santitation Commission.

## New Source of Botulism Found

Studies disclosed unsuspected sources of botulism in the aquatic environment and hitherto unknown means of toxin transmission to birds. Aquatic invertebrates appear to be a reservoir and under certain conditions transmit the disease to feeding waterfowl. When blowflies were fed type-C toxin and then were eaten by ducks, increased infection rates resulted. Prompt destruction of dead and dying birds appears a necessary control measure.

## Diseases of Fish Challenging

Early in 1960, Federal and State fish hatcheries throughout the Nation experienced a severe outbreak of liver tumors in rainbow trout, resulting in mortalities and debilitation of epidemic proportions. Bureau pathologists identified the disease as hepatoma, and provisionally eliminated contagious disease organisms as the probable cause. Nutritionists started a laboratory search. Experiments revealed that some fat-soluble component in the trout food is a precursor of hepatoma. This pioneer work fixed the enemy for further attack by many cooperating research institutions. Bureau scientists have coordinated their efforts with seven universities, three cancer research institutes, and four international agencies in studying the disease. Prevention of trout hepatoma drew nearer during the year. By working closely with the National Cancer Institute, the Bureau also made important contributions in the broad field of cancer research.

Other trout diseases attacked by Bureau pathologists include serious outbreaks of whirling disease, presumably introduced from Europe, and infectious pancreatic necrosis (IPN). Whirling disease has increased in government and private hatcheries in Pennsylvania and Connecticut. Efforts are being made to stop its spread and to define the life cycle of the parasite so that prophylactic methods can be devised.

IPN also reached serious proportions in western hatcheries. A test for diagnosing the disease was developed. Tissue cultures were inoculated with the untreated virus, with the virus after heat treatment, and with the virus mixed with immune serum (anti-IPN). Results were positive only with the untreated virus inoculation. Transmission of the virus disease is effected with or by trout eggs, and infection-free female broodstock is being selected to eliminate the disease.

## RECREATION GROWS ON FISH AND WILDLIFE AREAS

Public Law 87–714, of September 28, 1962, authorized the Secretary of the Interior to develop and manage national wildlife refuges, game ranges, national fish hatcheries, and other conservation areas for "appropriate or secondary use for public recreation, to the extent that such use is compatible with the primary purposes of such areas."

In providing increased recreational opportunity under this new law, the Bureau gave initial consideration to programs of interpretation, including construction of refuge and hatchery visitor centers. These centers will have facilities for exhibits, auditoriums for lectures, and facilities for dispensing leaflets, maps, and tour information. Where public recreation needs are particularly heavy, consideration is being given to other recreational facilities as long as uses are compatible with the areas' primary purposes.

Control and prevention of various kinds of pollution are needed to preserve the [illegible] and recreational value of such scenes as this trout stream in the wilderness.

## New Recreational Facilities Provided

The Accelerated Public Works program, providing employment in distressed areas, contributed significantly to development of certain national wildlife refuges. Projects covered construction of dikes and other water-control structures, leveling and other land-improvement operations, habitat betterment, service buildings, and public recreation features such as roads and trails, picnic areas fishing accesses, and swimming beaches. Accelerated Public Works funds permitted construction of visitor centers on the Moosehorn National Wildlife Refuge in Maine, Blackwater National Wildlife Refuge, Maryland, Seney National Wildlife Refuge, Michigan, and Kentucky Woodlands National Wildlife Refuge, Kentucky. Projects were developed on 18 refuges under total allotment of $3,241,000.

## Fishing on Federal Areas Increases

Technical assistance given to 239 military and other Federal installations and 39 Indian reservations by the Bureau of Sport Fisheries and Wildlife during 1962 furthered recreational fishing on these lands. In 1962, waters on such areas produced about 3 million man-days of sport fishing directly traceable to this program. Assistance to non-Federal areas brought this total to 3.2 million man-days of fishing. Some of the benefits to sportsmen from the cooperative fishery management program during the past year included reclaiming or improving 592 miles of streams and 5,422 acres of fish habitat, development of 2,844 acres of new fishing waters, and the stocking of 15,900,000 hatchery fish.

## Hunting Regulations Studied

Effects of hunting regulations on the kill of waterfowl and mourning doves now are being measured with an adequacy that provides information useful in setting seasons to produce a desired level of harvest. Findings indicate that the timing of seasons affects the size and, for some species, the sex and age classes of birds killed. Differentials in time of migration among species, in age classes, and in sexes may to some degree open the way to larger harvests with less loss of breeding stock—a consideration of importance in an era of expanding demand and diminishing supply.

Reliable comparisons of mourning dove population and production trends by years and areas are essential to establishing equitable and biologically sound hunting regulations. To this end, the Bureau has defined standards that insure greater uni-

cientists measure the clarity of water to determine the need for improvement of waterfowl nd fish habitats. Submerged aquatic plants, many of which are key waterfowl food, quire water clear enough for light penetration.

ormity in breeding-population counts over the entire mourning dove range, resulting in more accurate prediction of fall populations.

## Annual Surveys Conducted

The Bureau again carried out its annual surveys to obtain facts n population status and distribution of waterfowl. These were he duck-wing collection survey during the hunting season to obtain information on age ratios in the hunting kill; the survey mong waterfowl hunters immediately after the season to measure he size and species composition of the kill and the effect of hunting regulations on hunter activity and success; the survey of wintering areas in early January to measure the distribution and elative number of birds remaining after the shooting season; he survey of major breeding areas in May, June, and July to measure size and distribution of the breeding population and the elative number of young produced; and a major endeavor to band oung birds on the breeding grounds for the purpose of establishing a relation between breeding grounds and harvest areas so that data from breeding ground surveys can be associated properly with the four flyways.

## Law Enforcement Reveals Violations

Combined enforcement activities of U.S. game management agents in fiscal 1963 resulted in apprehension of 6,609 persons for violation of Federal or State game and fish laws. Enforcement activities are summarized in the accompanying table. In addition, Federal game management agents, in cooperation with State conservation officers, assisted in the apprehension and prosecution of 2,275 violations of State laws and regulations involving resident game and fish. Of these cases, 2,215 were found guilty.

*Table of cases involving violations of wildlife conservation laws enforced by the Bureau of Sport Fisheries and Wildlife, fiscal year 1963*

| | Pending July 1, 1962 | New cases | Pending June 30, 1963 | Terminated | Fines and costs | Jail sentences (days) | Probation |
|---|---|---|---|---|---|---|---|
| Migratory Bird Treaty Act | 460 | 3, 530 | 432 | 3, 558 | $126, 738. 96 | 6, 456 | 130, 679 |
| Migratory Bird Conservation Act | 63 | 440 | 39 | 464 | 12, 196. 60 | 923 | 4, 740 |
| Bald Eagle Act | 1 | 12 | 2 | 11 | 586. 30 | -------- | -------- |
| Lacey Act | 4 | 51 | 2 | 53 | 4, 311. 50 | 120 | 4, 380 |
| Black Bass Act | -------- | 7 | 2 | 5 | 550. 00 | 120 | -------- |
| Migratory Bird Hunting Stamp Act | 41 | 299 | 37 | 303 | 6, 777. 80 | 35 | 4, 380 |
| Assault Act | 1 | 4 | 2 | 3 | -------- | 2, 920 | -------- |
| Total | 570 | 4, 343 | 516 | [1] 4, 397 | [2] 151, 161. 16 | [3] 10, 574 | 144, 179 |

[1] Includes 271 cases on which prosecution was declined; 126 actions dismissed; and 58 acquitted.
[2] Includes $12,992.20 suspended.
[3] Includes 6,275 days suspended.

## Foreign Game Birds Introduced

Cooperative agreements on foreign game introduction were in force in 45 States. Trial liberations of introduced birds were underway in 16 States and the Territory of Guam. All but 2 of the 16 species or subspecies under study were being reared in appreciable numbers on game farms in 21 States.

## Waterfowl Land Acquisition

To preserve migratory waterfowl resources for the future, the Department of the Interior has a long-range goal of 4.5 million additional acres of wetlands for refuges under the Migratory Bird Conservation Act and for waterfowl production areas under the Migratory Bird Hunting Stamp Act. Since fiscal 1961, all receipts from duck stamps, except expenses incurred by the Post

Office Department in selling these stamps, have been available for land acquisition.

Because duck stamp funds are not sufficient to acquire the needed lands while they still are available and reasonably priced, Congress, in the Wetlands Loan Act (Public Law 85–585, 1961), authorized appropriation of not to exceed $105 million for a 7-year period beginning with fiscal 1962. These funds are a loan to be repaid from duck stamp receipts beginning with fiscal 1969. No money was appropriated under this authorization for fiscal 1962, but Congress appropriated $7 million for fiscal 1963 and $10 million for fiscal 1964.

The Department's 7-year program proposes acquisition of some 2.5 million acres of land, about 56 percent of the ultimate goal. Of this, about 1 million acres would be for new refuges or additions to existing refuges, and 1.5 million acres would be for waterfowl production areas in the Prairie States, of which about 465,000 acres would be acquired in fee and the remainder by easements to prevent destruction of their wetlands character. The program in the Prairie States has been slowed by reluctance of State Governors to grant the approval required by the Wetlands Loan Act because of the removal of land from local tax rolls.

In fiscal 1963, funds were obligated for acquiring 63,227 acres of land for national wildlife refuges. These lands were in 30 separate units in 23 States. In addition, funds were obligated for acquiring 25,328 acres of land for waterfowl production areas in Minnesota, Nebraska, North Dakota, and South Dakota. Of this total, 12,554 acres will be acquired in fee and 12,774 acres will be covered by easements to assure preservation of the wetlands from drainage, filling, or burning.

## Wetlands Inspection Program Starts

With enactment of Public Law 87–732 in 1962, the Department started a new program in Minnesota, North Dakota, and South Dakota of inspecting wetlands for which technical assistance or drainage cost-sharing has been requested. Lease or purchase offers are made to landowners for areas of high wildlife value before Federal drainage assistance is granted.

The program is conducted in cooperation with agencies handling Agriculture's drainage assistance program. It implements policies voiced by the President in his special message to Congress of January 23, 1961, in which he expressed the hope that coordinated Federal leadership could expand fish and wildlife opportunities without the conflicts whereby one department pays to have wetlands drained while another is purchasing such areas for wildlife

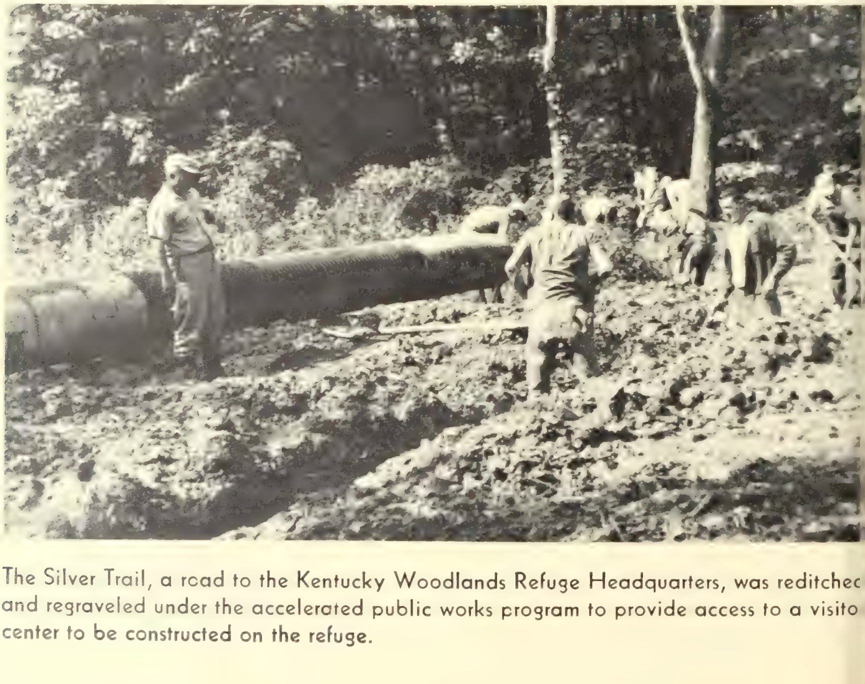
The law applies to all counties in the three "pothole" States, and the inspection program is concentrated in the counties where wetlands are of critical importance for wildlife habitat. During the first 6 months of the program, October 2, 1962, to March 25 1963, a total of 5,630 applications for drainage assistance were referred to the Bureau for inspection by county committees in the three States.

Drainage referral inspections are integrated with acquisition of small wetlands under the Wetlands Loan Act.

## New Waterfowl Refuges Authorized

In fiscal 1963, the Migratory Bird Conservation Commission approved acquisition of land for nine new waterfowl refuges as well as the addition of 22,857 acres of land to eight existing national wildlife refuges in nine States. The new refuges approved by the Commission included:

**Toppenish National Wildlife Refuge** in the lower Yakima Valley, Yakima County, Wash., with an eventual area of 12,379 acres will preserve and protect a remaining waterfowl habitat, permit restoration of drained and reclaimed areas, and increase the utility



The Silver Trail, a road to the Kentucky Woodlands Refuge Headquarters, was reditched and regraveled under the accelerated public works program to provide access to a visito center to be constructed on the refuge.

of the area to waterfowl through development and management of water, nesting cover, and resting and feeding areas.

**Pahranagat National Wildlife Refuge** in Lower Pahranagat Valley, Lincoln County, Nev., will assure maintenance of habitat well located to serve waterfowl using this part of the Pacific Flyway. The total area is 4,826 acres, of which 944 acres will be reserved from the public domain.

**Willamette National Wildlife Refuge** in Benton County, Oreg., will have an acreage of 5,371. It will provide some protection for the western Canada goose which has been subjected to heavy hunting pressure in this area, and will also serve ducks, swans, and water birds.

**Oconee National Wildlife Refuge** on the Oconee River in Wilkinson County, Ga., will fill a need for a waterfowl refuge in central Georgia. Because of insufficient and undependable habitat, ducks migrate through this area but do not winter there in appreciable numbers. The Bureau anticipates that after development, peak populations of 15,000 to 25,000 ducks will use the area during the fall and winter.

**Sudbury National Wildlife Refuge** is along the Sudbury and Concord Rivers, Middlesex County, in eastern Massachusetts about 14 miles west of Boston. The 3,879 acres proposed for acquisition include the most important areas of flood-plain waterfowl habitat in the locality. Major objective will be production of waterfowl, principally wood ducks, black ducks, mallards, and blue-winged teal. The area will also provide for migrants.

**Lake Woodruff National Wildlife Refuge,** Volusia County, on the St. Johns River in east-central Florida, will have an eventual area of about 19,000 acres. It will provide feeding and resting habitat for puddle ducks and diving ducks and other migratory birds.

**Pungo National Wildlife Refuge** in Washington and Hyde Counties, N.C., is in an area that plays an important role in the use pattern of waterfowl migrating through and wintering in eastern North Carolina. This refuge with an eventual acreage of 12,287 will provide protection for the large numbers of geese and ducks utilizing this area and will alleviate crop depredations in this agricultural region.

**Primehook National Wildlife Refuge,** Sussex County, Del., is along Delaware Bay. The 11,233 acres approved for acquisition are in an area of major importance to the waterfowl populations of the Atlantic Flyway. The Bureau estimates that after development the refuge will produce 1,500 waterfowl annually and will serve 75,000 birds during migration.

**Lake Nettie National Wildlife Refuge,** McLean County, N. Dak., with a total of 3,300 acres, will increase the nesting potential for mallards, pintails, blue-winged teals, and shovelers in this important breeding and feeding area.

Establishment of the **Eufala National Wildlife Refuge,** in connection with the Walter F. George Lock and Dam Project in Alabama and Georgia, was authorized by the Rivers and Harbors Act of 1962. This project is under construction by the Corps of Engineers. The refuge authorization is an excellent example of how a multipurpose water development project can be planned to provide substantial benefits to migratory waterfowl at moderate cost, since most of the land would be purchased for the project with or without a refuge.

The new refuge will have 10,755 acres, including 8,440 acres of project lands to be purchased in fee title, 453 acres of project lands to be converted from easement to fee title, and 1,858 acres of lands additional to project lands. The refuge will be administered by the Bureau of Sport Fisheries and Wildlife. Public hunting opportunities will be provided on and near the refuge. Other types of outdoor recreation also will benefit.

Under the accelerated public works program, new recreation facilities such as this picnic shelter with tables and charcoal grills were provided on Blackwater National Wildlife Refuge.

### Three New Refuges Activated

Three new refuges were placed under active administration. They are:

**Clarence Rhode National Wildlife Range,** an area of 1,871,400 acres on the Bering Sea coast between the Yukon and Kuskokwim Rivers, is the primary nesting area for the cackling Canada goose, a major nesting ground of the black brant, and the home of much of the total population of the emperor goose. A headquarters tation was constructed at Bethel, Alaska, on the Kuskokwim River.

**Ottawa National Wildlife Refuge,** in north-central Ohio bordering on Lake Erie, will encompass 5,500 acres of valuable marsh and crop lands expected to accommodate large numbers of nesting and migrating waterfowl.

**Choctaw National Wildlife Refuge,** 4,250 acres, is above Jackson Dam on the Tombigbee River in southeastern Alabama. Its comination of farmland and open water will make it an important wintering area for waterfowl in the Mississippi Flyway.

In addition to their value to migratory birds, these new refuge reas will produce large numbers of upland game birds and bigame animals. They will also provide recreation, especially shing and hunting.

### National Wildlife Refuge Renamed

Fort Peck Game Range in Montana was renamed Charles M. Russell National Wildlife Refuge, in honor of Montana's famous aturalist-artist. The Bureau of Sport Fisheries and Wildlife was esignated primary administrator of the area, which for several ears had been managed jointly with the Bureau of Land Mangement. The new development plan provides for major wildlife anagement with programs of recreation and land-use development on this area—one of the Nation's outstanding undeveloped ildlife areas.

## MANAGEMENT PROGRAMS WIDESPREAD

### oil and Moisture Conservation

The Bureau's soil and moisture conservation program received onsiderable emphasis during the year. While there was still a acklog of soil depletion and erosion problems, many of the most rgent projects were being controlled. Soil and moisture funds creased from $207,000 in fiscal 1961 to $705,000 in 1962; the umber of refuges participating in the program increased from 64.

These rainbow trout were reared at Norfolk National Fish Hatchery, Ark., to stock wate in Arkansas and Missouri and enhance recreational fishing for thousands of anglers.

with over 2 million acres, to 96 totaling 9 million acres. Soil and moisture conservation plans were prepared for approximately 100 refuges and 15 other plans were amended.

## Forest Planning and Development Progress

In his first natural resources message to Congress, and later in his message on conservation, President Kennedy cited the need for completing forest development and planning on Department lands.

In response to these messages, a report by the Department recommended four essentials for a balanced program on Interior forest lands, the first of which was "expansion in the forest inventory and management planning programs and an increase in the forest capital investments related to the national wildlife refuges." Pursuant to this recommendation, a report, "Forest and

Wildlife on the National Wildlife Refuges," was submitted to the Secretary. It outlined contributions that Bureau of Sport Fisheries and Wildlife forests can make to the Nation's forest wildlife, recreation, and economic future. It also described management needs, based on an analysis of timber volume, growth, and values. This program started in fiscal 1963. Allocation of funds for this purpose in fiscal year 1964 will expand the program.

## Wildlife Conserved

Trumpeter swans have demonstrated that they can establish themselves when transplanted into suitable environments. Four pairs nested on the Malheur National Wildlife Refuge, Oregon, and newly hatched cygnets and one pair of incubating swans were seen at Ruby Lake National Wildlife Refuge, Nevada. Successful nesting of at least one pair of these swans on Lacreek National Wildlife Refuge, South Dakota, represents the first hatching of trumpeters in the Great Plains in nearly 80 years. These swans were introduced from Red Rock Lakes National Wildlife Refuge, Montana.

Two nests of the Everglade kite were found on Loxahatchee National Wildlife Refuge in Florida. During the past two decades, the Everglade kite has become one of the rarest birds in the

tensive banding operations provide valuable management information for determining aterfowl migration routes, obtaining population characteristics, and associating [illegible] cks with their breeding and wintering grounds.

United States, with fewer than 10 known pairs surviving, all in the Lake Okeechobee district to the north of Loxahatchee. Discovery of these nests on the refuge raises hopes that the kite, which feeds primarily on the *Ampullaria* snail, will become established in another location. The Bureau hopes that suitable water levels in the refuge on which the existence of snails and kites depends can be maintained by the Central and Southern Florida Flood Control District.

The national bird, the bald eagle, is a prominent part of the birdlife on Kodiak National Wildlife Refuge, Alaska. A recent survey showed that the birds were incubating eggs on 148 nests in the area. Forty-nine of the nests were built on cliffs; the rest were in cottonwood trees. In addition to the occupied nests 156 unoccupied nests were observed. Only 368 bald eagle nests were reported in the 48 contiguous States—257 of them in Florida

Field studies on Buldir Island in Aleutian National Wildlife Refuge, Alaska, disclosed that Aleutian Canada geese were nesting on that island. This small, dark form of the Canada goose has been greatly reduced as a result of introduction of blue foxes in the Aleutians in an attempt to increase the natives' fur catch Since foxes were not released on Buldir and are now being controlled on some islands where they were introduced, the Bureau hopes that goslings captured on Buldir will play a part in reestablishing Aleutian Canada geese on many other islands in the refuge

The maximum number of whooping cranes on Aransas National Wildlife Refuge, Texas, during the past winter was 32, or 6 less than counted the previous year. It was the first season in several years that no young cranes were produced in northwest Canada.

Five musk ox bulls were collected on Nunivak National Wildlife Refuge, Alaska, for display by museums. These musk ox are descendants of a herd of 34 brought from Greenland in 1930 and are the only musk ox in Alaska. Aerial census showed the population to be 360.

# WILDLIFE CONSERVATION GAINS

## Fish and Wildlife Restoration Advances

The 25th anniversary of the Pittman-Robertson Act (approved September 2, 1937) was observed in fiscal 1963. State fish and game departments have an impressive list of accomplishments, due to Federal excise tax funds made available for fish and wildlife

ousands of Americans will enjoy good fishing as a result of this cooperative fish stocking ogram at Lake Powell on the Upper Colorado River.

estoration by the Pittman-Robertson and Dingell-Johnson Acts. pecies that were low in numbers have been reintroduced and are ow providing or will provide additional sport. More than 2.4 illion acres of land and waters have been acquired, and 11.5 illion acres leased for refuges, production areas, or public access. xisting habitats have been improved and new ones have been eated. Excellent research studies have led to more effective anagement of fish and game and better harvesting regulations.

Regular program funds apportioned to States and territories in scal 1963 were nearly $13¾ million for wildlife restoration and er $5½ million for fish restoration.

A new departure in financing occurred through the availability more than $6½ million of Accelerated Public Works funds. tate fish and game departments matched this Federal investment. hese funds, part of the direct-action program by the Federal overnment to reduce unemployment, were the first to be appro- iated by the Congress directly for State fish and wildlife proj- ts under this emergency act. The money was to be spent in stressed areas to provide local employment through capital im- ovements (excluding land acquisition) for the betterment of inting and fishing.

## Wildlife Fed Grain

Commodity Credit Corporation grains were made available States for wildlife feeding programs, as provided for by Publ Law 87–152. Due to milder weather, the amount fed winterin wildlife was much smaller than the previous year.

## Cooperative Action Safeguards Fish and Game

Cooperative planning by the Bureau of Sport Fisheries and Wil life and State fish and game agencies assures that development the Upper Colorado River will cause a minimum of damage to fis and wildlife. In some instances there will be improvement in co ditions for these resources. The Colorado River Storage Projec a basinwide water-development project, authorized in 1956 f construction by the Bureau of Reclamation, is progressing rapidl Three of the four major storage units are nearing completion.

The authorizing act emphasized the importance of fish and wil life conservation. Measures in response to this authorization i clude at least two national fish hatcheries, a national wildli refuge, development of State-managed big-game and waterfo areas, purchase of access areas and easements, and developme of reservoir fishery programs. The Department expects that the actions will create many benefits to the five upper-basin States b increasing outdoor recreation opportunities and expenditures.

## Susquehanna River Shad Restoration Studied

During the year, the Pennsylvania Fish Commission approve a resolution requesting the Department of the Interior to ask t Federal Power Commission to require the owners of Conowing Dam on the Susquehanna River to construct a fishway at that da Consultants of the Pennsylvania Fish Commission previously ha concluded that properly constructed and operated fishways at t Susquehanna River dams were feasible and would successfull pass runs of anadromous fish.

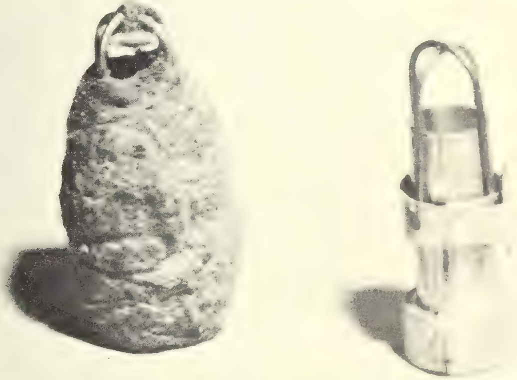
Interior Department representatives held several meetings wit representatives of Maryland, New York, and Pennsylvania to co sider the biological problems associated with the restoration anadromous fish.

It was decided that before construction of fishways was unde taken that a 2½-year biological study be made to determine sui ability of the Susquehanna to support anadromous fish. The fou power companies involved agreed to assume the costs of the bi logical investigations ($196,500) and the Department and the power companies signed a contract to this effect. This contract was approved by the Federal Power Commission.

## Cooperative Education Increases

Two new cooperative wildlife research units were activated during the year—one at Cornell University in New York and one at Louisiana State University—and a unit was authorized for South Dakota State College. These brought to 18 the number of such cooperative units for training career workers in wildlife ecology and management.

The supply of trained fishery biologists has never equaled demand. To help meet this deficiency, six new cooperative fishery units were established in fiscal 1963. They are at Colorado State University, University of Georgia, Louisiana State University, University of Maine, University of Missouri, and North Carolina State College. With the unit established at Utah State University in 1962, there were seven such units in fiscal 1963.



he Bureau of Sport Fisheries and Wildlife seeks control techniques that avoid undue azard to wildlife and to humans. A safety device of a crossed wire guard over the open op of the humane coyote getter prevents the paper seal of the trapping cartridge from arming humans who accidentally pull the triggering mechanism.

## CONTROL TECHNIQUES ADVANCE

As competition between man and wild animals increases, the roblems of animal damage inevitably become more acute. The ureau seeks control techniques that are specific for the animals oncerned and that avoid undue hazard to other wildlife species, o domestic stock, and to humans.

## New Snare Developed

A new-type snare for capturing destructive bears catches higl on the leg without breaking the skin and holds the animal relativel quiet. Unwanted wild animals as well as livestock can be release unharmed.

In some trapping areas, bait containing a tranquilizer is place beside a steel trap so the trapped animal remains peaceable an can be released unharmed if desired.

A crossed wire guard over the open top of the humane coyot getter prevents the paper seal of the trapping cartridge fron harming humans. In addition, a plastic sign is placed besid each "getter set" to warn persons who might be tempted to tampe with it. Reproductive inhibitors were tested as a method o coyote control. The most effective chemical tested, synthetic estrogen, was readily accepted in food by penned animals. Fiel trials with specially prepared baits were underway at year's end

The mechanical burrow builder developed by the Bureau severa years ago to control pocket gophers by placing baits undergroun has proved so successful that several commercial companies now manufacture it. A new toxicant, with low hazard to domesti birds and animals, has been developed for use with the bai dispenser.

The nutria problem is acute in coastal Louisiana and Texas where water-control structures and crops are being damaged by this introduced rodent. New studies on methods of nutria contro were begun in fiscal 1963 at Houma, La., and Beaumont, Tex.

Several hundred chemicals were tested during the year to determine their effectiveness as repellants of animals that annually cause great damage in nurseries, orchards, and forests. As a result of more efficient methods developed at the Bureau's Denver Wildlife Research Center, the time required to test these new materials was reduced from 100 days to 15, making it possible for the researchers to examine far more compounds. Of the several hundred chemicals tested, 10 showed promise in the control of depredating deer, porcupines, field mice, mountain beavers, and hares. They are undergoing field tests in the northwestern United States.

Rabies in wildlife has continued in many areas. The Bureau cooperated closely with the Pan American Sanitary Bureau in establishing a coordinated control program with Mexico and several governments in the Caribbean area. Rabies is present along the entire United States-Mexico boundary from the Gulf to the Pacific, and in mongooses in several of the Caribbean islands.

## Birds Controlled

Under certain weather conditions, as when crops cannot be harvested because of rain or the season is late, great damage may result to farmers' crops from migrating or wintering waterfowl. Government-owned grain is available for feeding these concentrations of birds to reduce damage to agricultural crops. During the year, only 28,753 bushels of grain was fed in waterfowl depredation control, compared with 65,826 in fiscal 1962.

Lethal baits and specially designed traps showed promise in controlling starlings and blackbirds at feedlots and other trouble spots. Tests of chemosterilants indicate the effectiveness of these agents as controls, but there are unsolved technical difficulties related to their use.

Pocket gophers, range pests over much of the forage-producing public lands, have been the object of intensive control studies by the Bureau of Sport Fisheries and Wildlife.

### Fish Control Laboratory Opens

The Bureau's new Fish-Control Laboratory, La Crosse, Wis., was dedicated October 25, 1962. Research is being conducted on methods and materials for general and selective control of undesirable fishes. Toxicants receive preliminary tests in the laboratory. Promising ones then are tested in outdoor plastic pools.

## FISH HATCHERY PRODUCTION AT NEW HIGH

Fish hatchery production was at a reccord high of 3,462,000 pounds of all species. The production of fish per man-year reached 6,841 pounds, and the conversion rate of 2.15—pounds of food required to produce 1 pound of fish—was the best yet attained. This continuing improvement results from better design of facilities, improved diets, intensified disease diagnosis and control, better fish-cultural practices, and more highly trained personnel, both academically and through inservice training. Thus far, 204 Federal employees, principally from national fish hatcheries, have completed one or more of the inservice schools in fish nutrition, fish pathology, or fish-cultural techniques.

Regular construction funds were made available in fiscal 1963 to complete Alchesay National Fish Hatchery in Arizona, which was dedicated October 20, 1962, and to complete Bowden National Fish Hatchery in West Virginia. Both are for trout. Funds were provided to begin construction of a new unit at Dale Hollow National Fish Hatchery (for trout) in Tennessee, and to continue development of four other trout hatcheries—Greers Ferry National Fish Hatchery, Arkansas; Norfolk National Fish Hatchery, Arkansas; Garrison Dam National Fish Hatchery, South Dakota; and Wytheville National Fish Hatchery, Virginia; and to continue work on Jordan River National Fish Hatchery, Michigan, for lake trout.

Funds also were appropriated to the Bureau of Reclamation, for transfer to the Bureau of Sport Fisheries and Wildlife, to begin construction of two new hatcheries authorized by the Colorado River Storage Project Act. These units will be at Jones Hole, Utah, and on Reclamation's Curecanti Unit in western Colorado.

Alchesay National Fish Hatchery, Ariz., located on the Fort Apache Indian Reservation on land made available by the White Mountain Apache Tribe, was dedicated October 1962. This modern hatchery has a potential annual production of 150,000 pounds of trout, principally for distribution to waters on Indian reservations.

The Accelerated Public Works program provided urgently needed funds to undertake or to speed work on several hatcheries. Projects included acceleration of work at Jordan River National Fish Hatchery, Michigan, and development of Hiawatha Forest National Fish Hatchery, Michigan, both for lake trout; expansion of production and related facilities at Craig Brook National Fish Hatchery, Maine, for Atlantic salmon propagation; construction of production facilities at the Tylersville Unit of Lamar National Fish Hatchery, Pennsylvania; rehabilitation of facilities at Tishomingo National Fish Hatchery, Oklahoma, one of the most important pondfish stations in the Southwest; and rehabilitation and expansion of the important hatchery and research center at Leetown, W. Va.

Above is an architect's exploratory sketch for the National Fisheries Center and Aquarium authorized in October 1962 and to be located in Washington, D.C.

### National Fisheries Center and Aquarium

The new National Fisheries Center and Aquarium was authorized by Public Law 87–758, October 9, 1962. This Center in the Nation's Capital will have facilities for research in fisheries and for appropriate display of fresh-water and marine fishes and other aquatic resources. Cost of building and maintaining the Center will be repaid from visitor and user fees.

## SPORT FISH STUDIED

### Fish Growth Enhanced

Methods were developed for artificial stimulation of spawning in channel and flathead catfish.

Studies of the effect of food on growth and condition of 12-year-old brook trout from an alpine lake show that even at this age, growth can be accelerated. Reducing the population of trout appeared to have little effect on the growth of the remaining fish. Poor mineralization, low temperatures, and limited food resulted in 12-year-old trout averaging 7.6 inches in length. One fish kept in a hatchery trough with adequate food doubled its weight in 6 months.

Stamina tests in standard hatchery raceway ponds have shown declines in performance of salmon fingerlings as they grow from 5 to 20 grams in weight, but in specially designed recirculating raceways, swimming performance increases gradually during the same growth period. Tests in a specially designed stamina tunnel indicate that lack of exercise prevents development of full swimming capabilities in conventional raceways. Modifications may be needed if hatchery salmon survival on release is to reach optimum levels. Swimming performance of fry has not yet been shown to be a factor influencing hatchery returns.

### Fish Farming Station Dedicated

The Fish Farming Experimental Station at Stuttgart, Ark., was dedicated October 21, 1963. Major research at this station is concerned with problems of fish production on flooded land in rotation with rice and other field crops.

### Fish Genetics Laboratory To Be Built

A site was acquired in northeastern Wyoming for a new fish genetics laboratory. Funds were appropriated for the planning and construction at this station in fiscal 1964.

## Reservoir Fishing To Grow

By 1976, half of all fresh-water angling is expected to be on reservoirs. This implies doubling of fishing pressure on these manmade waters.

Some new approaches to the study of fish populations in big impoundments are being made in the White River chain of reservoirs in Arkansas and Missouri, including coordinated use of modified trawls and electrofishing gear. University scientists, under contract to the Department of the Interior, are studying preimpoundment conditions in a river valley that contribute to reservoir fertility.

On the upper Missouri River, new automatic monitoring systems are being used which continuously measure water temperature, acidity, dissolved oxygen, turbidity, conductivity, and sunlight intensity of reservoir waters.

## Small Submarine Used

Bureau laboratories at Sandy Hook, N.J., and Tiburon, Calif., sought solutions to several of the many problems of sport fishes in coastal waters. A small, two-man submarine was used on the west coast to study distribution and behavior of fishes. In another new approach, aerial surveys of water surface temperatures are facilitating near-simultaneous observations over large ocean areas on both coasts for correlating surface temperatures with fish movements and concentrations.

he Bureau of Sport Fisheries and Wildlife's new two-man submarine aids studies on the istribution and behavior of fish off the west coast.

Studies on the vitamin content of inshore waters and its relation to plankton and fish production were underway at the Sandy Hook laboratory. A marlin and sailfish tagging program was started on the west coast.

## RESEARCH REPORTED

Research findings and other information concerning the work of the Bureau were presented in 125 technical reports, circulars, and leaflets published by the Department during the year. More than 300 articles also were written by the Bureau's staff for scientific and professional journals.

# Bureau of Commercial Fisheries

## Donald L. McKernan, Director

The Bureau of Commercial Fisheries of the Fish and Wildlife Service has a responsibility for carrying out a national fishery policy. This policy has three principal objectives: To increase and maintain America's fishery resources at a level to yield a maximum annual harvest; to strengthen and maintain a vigorous fishery industry; and to perform these duties in partnership with the States and in accordance with America's international obligations, without sacrificing the free enterprise system.

To discharge these responsibilities to the Nation, the Bureau engages in a wide range of activities. Its research and development programs concern many fields of science and technology, ranging from studies of the basic productivity of salt and fresh water to investigations of the methods of preserving fishery products. Included are such fields as biological and physical oceanography, ecology, physiology, parasitology, serology, atomic energy applications, refrigeration engineering, food technology, economics, fishing gear engineering and chemistry.

In addition to its research and development programs, the Bureau provides many services to industry. It collects information on foreign fishing activities and helps promote fish consumption. It also provides market news reporting, statistical surveys, and programs of financial assistance to the fishing industry.

For the benefit of the Nation and the fishing industry, the Bureau also operates the fur-seal industry in the Pribilof Islands, supervises the Columbia River Development Program, and participates in many international meetings on natural resources.

Significant progress was made during fiscal 1963 by Bureau scientists in research and development of the fishery resources, thus

Last year America's fishermen landed some 5¼ million pounds of fish and shellfish worth nearly $381 million at dockside—an important contribution to the Nation's economy.

strengthening the role of the fishing industry as an important contributor to the national economy.

## Oceanography Studies Progress

During the year marked progress was made in many phases of marine science: Physical and chemical oceanography, physiology and behavior of fishes, definition of fish stocks, and the interrelation of fish stocks and environmental factors.

Published during the year was an "Atlas of the Oceanographic Climate of the Hawaiian Islands Region," which included calculations of heat transfer and energy systems related to ocean currents and atmospheric conditions in that region. Detailed analysis of North Pacific sea surface temperature conditions during the winter of 1962–63 revealed large masses of unusually warm water in the central Pacific that, as judged by meteorologists, may have been a factor in the far-from-average weather conditions that prevailed over much of the North American Continent in the winter of 1962–63.

Bureau scientists at the San Diego, Calif., biological laboratory, in cooperation with Scripps Institution of Oceanography, prepared a series of topographic charts of the eastern Pacific showing locations of seamounts and other features of the ocean floor. Fish appeared to accumulate around seamounts, presumably due to abundant food. This laboratory also issued monthly temperature charts for a wide area of the eastern Pacific and 15-day charts for the principal tuna fishing grounds. The charts assisted fishermen in locating fish and also were useful to biologists, oceanographers, and meteorologists.

The Department participated in two international oceanographic expeditions. Members of the Bureau of Commercial Fisheries biological laboratory, at Washington, D.C., played a major role in planning the International Cooperative Investigations of the Tropical Atlantic. The first cruise of the multiple-vessel expedition (EQUALANT I) was carried out in the spring of 1963; a second cruise (EQUALANT II) followed in the summer. Staff members of laboratories at Honolulu, Hawaii, and Seattle, Wash., planned many of the biological and fishery studies of the Indian Ocean Expedition and participated in Cruise I of the *Anton Bruun* in the Indian Ocean in March and April of 1963. They also were scheduled to participate in several other cruises to follow. Both the tropical Atlantic and Indian Ocean studies will contribute to greater knowledge of the location and size of fish stocks of interest to U.S. fishermen and to the underdeveloped countries bordering those oceans.

New and improved instruments are one of the most critical needs of the oceanographic program. An instrumentation unit was added early this year to the Bureau's Biological Laboratory at Washington, D.C., to keep Bureau scientists apprised of developments in this field and to coordinate development and procurement of oceanographic equipment in the Bureau. This unit served also as a liaison between the Bureau of Commercial Fisheries and other agencies in the Department of the Interior and in other Federal departments.

Efforts were increased in the field of taxonomy, particularly identification of marine organisms. Taxonomic studies have a high priority in the National Oceanographic Program because they are basic to biological investigation. A new field station for taxonomic studies in the Pacific was established early in 1963 at Stanford, Calif., and the research program of the Brunswick, Ga., laboratory was reorganized to give greater emphasis to basic taxonomic and life history studies.

## Fish Physiology and Behavior

Department scientists continue to add to the mass of information on the development, physiology, and behavior of fish. Studies were underway on tuna reactions to purse seines and the relation between purse-seine catches and water temperatures below the surface of the sea. Department scientists have learned that there

A California tuna purse seiner sets her net at full speed.

is a close relation between the catches by purse seiners and the temperature structure of the water. At the Honolulu laboratory, captive tuna were trained to react to underwater sound and to striped patterns as a prelude to measuring their audio and visual response, which undoubtedly influences their reactions to various fishing methods.

An interesting advance was made by biologists at the La Jolla, Calif., biological laboratory in their study of the early development of fishes. They employed an apparatus to investigate fish development at 18 different temperatures simultaneously. The overall effects of many temperatures on the development of one group of fish eggs were determined in a single experiment.

## Forecasts for Fish Abundance Developed

Intensive research in fiscal 1963 developed reliable methods predicting where and when fish will concentrate. Since 1959, annual predictions based on changes in ocean circulation have been made for the catch of the Hawaiian skipjack fishery. The prediction technique has been refined by recent research; however, the mechanisms involved are not yet completely understood. A major interagency study is being planned for fiscal 1964 to obtain information for answering many of the "why" questions. In the eastern Pacific, predictions can now be made of the distribution and relative abundance of albacore and bluefin tuna during the summer on the basis of rates of warming of sea water during early spring. In the northwest Atlantic, the year-class strength and general abundance of groundfish stocks and sea scallops of the New England banks are now being predicted annually.

## Salmon Research Heartening

High dams, existing and proposed, on the middle Snake River in Idaho present difficult problems regarding salmon passage and maintenance of salmon runs in a changing river environment. Progress on these problems has resulted from the efforts of Bureau scientists in the fish passage research program and from cooperative studies by the State fisheries agencies of California, Idaho, Oregon, and Washington. Particularly encouraging are advances in disease control by the Oregon Fish Commission that increased survival of adult chinook salmon. Chemical treatment at two holding ponds showed a decrease in adult salmon losses from 62 percent to 20 percent.

To reduce natural losses and to bring the herd to the point of highest sustained yield, Bureau of Commercial Fishery biologists take a predetermined number of female fur seals each year during sealing operations on the Pribilof Islands.

Construction required for research projects of the accelerated fish passage studies was nearly completed. A large test flume facility at Troy, Oreg., will soon be in operation to test the behavior of juvenile salmon under various conditions of water velocity and pressure.

Tests of the 1-on-10 slope fish ladder at Ice Harbor Dam were completed and the final report was submitted to the Corps of Engineers. It was concluded that the steeper slope design is as satisfactory for the passage of salmon as the 1-on-16 slope used at existing dams, while construction costs are about one-half those of the conventional ladder.

Salmon research in the North Pacific continued. Acquisition and conversion to ocean research by the Department of a 176-foot Navy vessel made year-round, high-seas research possible and added greatly to knowledge of the ocean and the distribution of salmon and areas of major abundance. This information is being correlated with related physical and chemical oceanographic data. Identification of North American and Asian stocks of salmon and the definition of areas of intermingling continued as a primary objective of high-seas salmon research.

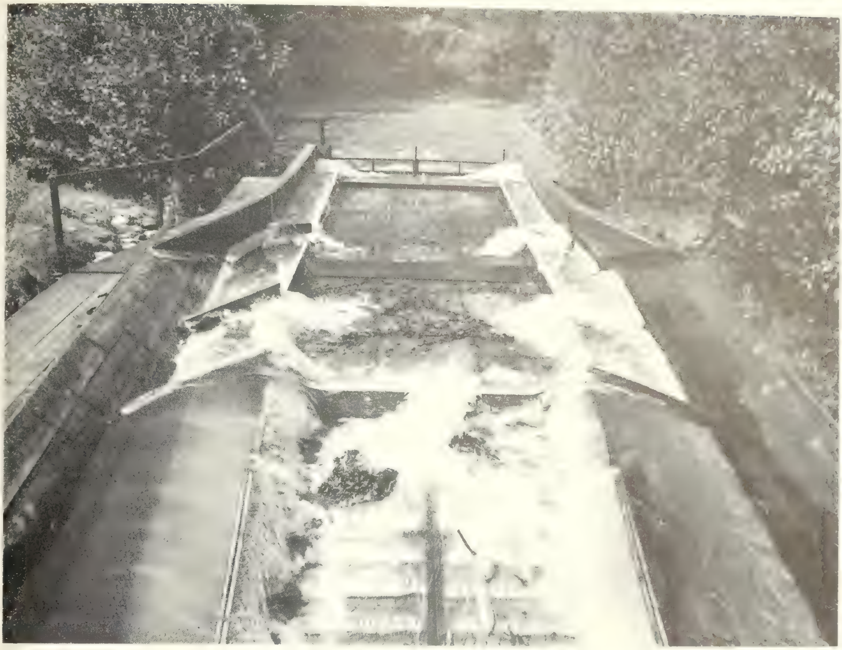
Within the past 3 years, much valuable information has been collected on the carrying capacity of red salmon lakes and spawning grounds in Alaska, ocean migration patterns of tagged salmon, and numbers of young salmon migrating to the ocean. This information has helped improve predictions of the salmon runs and has strengthened U.S. proof of full utilization by Americans of red salmon stocks—an important point in our country's position relating to the renegotiation of the North Pacific Fisheries Convention with Canada and Japan.

## Foreign Fishing Increases

Fiscal 1963 witnessed greatly increased fishing activities by foreign vessels off the New England and Middle Atlantic coasts. Investigations were underway to determine the effects of this great increase in fishing effort on fish stocks. Historically, these are very productive areas, and it is essential to the American fishing industry that ways be found to conserve these resources.

## Sea Lamprey Control Advances

Great strides were made in controlling the destructive sea lamprey in the Great Lakes with a chemical toxicant lethal to lamprey larvae but harmless to game fish. Lamprey control operations are carried out under the Great Lakes Fishery Commission in which



Incline-plane traps, such as this one on the Garlic River in Michigan, are used to capture and observe the downstream drift of sea lamprey ammocetes and developing sea lampreys.

the United States (through the Department of the Interior), the Canadian Government, and the Provinces and States abutting the Great Lakes, are represented. In 1963, an index of the adult lamprey population in Lake Superior was obtained at electric barriers on a number of streams tributary to the lake. As in 1962, the lamprey population remained at a level approximately 85 percent below that noted before control operations began.

Catches of juvenile lampreys in fyke nets in treated streams of Lake Superior and untreated streams of Lake Michigan were additional evidence of the effectiveness of chemical control. Biologists report that treated streams contained 97½ percent fewer young lampreys than untreated streams. Encouraging also was the reduction in the incidence of lamprey wounds on lake trout in Lake Superior and the increase in numbers of larger trout.

Because of the evidence that control methods had been successful in reducing the lamprey population in Lake Superior to a low level, the Commission recommended expansion of the control program in Lake Michigan. Fifty-four lamprey-infested streams in northern Lake Michigan have been treated successfully.

## Whitefish Research Reveals New Facts

Excellent progress was made during the year in increasing knowledge of the coregonids of the Great Lakes, including lake whitefish, river whitefish, and eight species of ciscoes. As a group, these fish have at different times been the backbone of the commercial fishery in each of the Great Lakes.

One of the difficult problems confronting fishery scientists has been the identification of juvenile coregonids. To understand the dynamics of the fish populations it is essential that measures of the abundance of various species be obtained throughout their lives. In fiscal 1963, biologists witnessed the spawning act of whitefish which had been reared from fertilized eggs at the Bureau's experimental hatchery at Northville, Mich. The event was unusual, for whitefish had never been reared to maturity nor had anyone ever observed the spawning act. This breakthrough was made possible through development of a system of temperature control and the application of antibiotics as a disease preventive. Such research is helping solve the problem of identifying young fish.

## Walleye Research Progresses

In Lake Erie and in Green Bay waters of Lake Michigan, trawling was conducted at several stations at regular intervals to measure the success of the reproduction of walleyes and other fish. This information is useful to the fishing industry, which needs an estimate of how much fish may be available in the future. An analysis of walleye tagging experiments in northern Green Bay and western Lake Erie established that walleyes return to their birthplace to spawn and provided information on the migratory patterns of the species and fishing intensity for it. This new knowledge provides a better basis on which to formulate management measures for the optimum utilization of the walleye resource.

## Pesticide Research

Possible damage to fish and wildlife from widespread use of pesticides has become of increasing concern to Federal, State, and private agencies. Greater numbers of people are now aware of the pesticide problem and have demanded measures to minimize its dangers to humans as well as wildlife and fish. Increased research on the effect of pesticides on living resources was demanded from all conservation agencies, including the Bureau of Commercial Fisheries. Fortunately, studies of the accumulation and effect of pesticides on fish and shellfish were begun several years

A gill net is hauled aboard the Department research vessel Siscowet during studies of the commercially important deep-water fishes of the Great Lakes.

ago, when biologists of the Fish and Wildlife Service recognized the potential danger to the Nation's commercial fisheries.

Small-scale field studies started in Florida and Washington during 1963 to determine the occurrence of pesticides in nature, observe the effects on marine species, and develop methods for more extensive research.

Laboratory experiments at the Gulf Breeze, Fla., laboratory show that very small quantities of many kinds of pesticides can be harmful to commercial fish and shellfish. These studies are designed to determine the lethal and sublethal effects of common pesticides on representative commercial species, such as oysters, shrimp, and crabs.

The insecticides, particularly the stable chlorinated hydrocarbons, were the most hazardous of the pesticides studied. For example, DDT at concentrations of 0.1 part per million (ppm) caused 60 percent of the test oysters to die within 36 hours. In the same test time, 0.001 ppm DDT caused a 38-percent decrease in shell growth of treated oysters compared with untreated oysters. Results in the same general order of magnitude were obtained with shrimp and crabs. Other pesticides, such as heptachlor, had somewhat similar effects. Pesticides may also be harmful to the food supplies of commercial species.

King crabs were taken by the merchant vessel Yaquina off Kodiak Island during studies of this valuable shellfish in Alaska waters.

The stable pesticides also were found to accumulate in the tissues of animals at concentrations many times greater than the concentration in the surrounding environment. Thus, the concentration of pesticides can build up through the food-chain to quantities which may be harmful to the commercial fish or shellfish or to humans using these animals as food. In laboratory studies, adult oysters exposed to 0.01 ppm DDT continuously for 7 days contained 132 ppm DDT at the end of the exposure period. This concentration decreased very slowly when the oysters were put in water without the pesticide. After 50 days DDT was still found in the oyster tissues in a concentration of 44 ppm.

## Fish Protein Concentrate Research Contracts Awarded

Congress appropriated approximately $450,000 for a program to develop methods for the manufacture of fish protein concentrate (FPC). This program is designed to provide a highly nutritious protein supplement to the predominantly vegetable and starch diets of peoples of developing nations and to provide American fishermen with a new industry that could utilize about 7 billion pounds of underutilized species of fish found in U.S. traditional fishing grounds.

Research contracts were awarded four groups to work with the staff at the Bureau's technological laboratory in College Park, Md. Texas Agricultural & Mechanical College has a contract to select and evaluate methods of preparing the raw fish. The Battelle Memorial Institute of Columbus, Ohio, has a contract to determine the most suitable of the solvent extraction processes, while Artisan Industries, Inc., of Waltham, Mass., will determine the best biological process method. The Ohio and Massachusetts research groups are to design and construct model scale units capable of processing 500 pounds per day of raw fish into FPC. The Massachusetts Institute of Technology has a contract to study the flavor and odor components of FPC and how to control them.

The College Park Laboratory will prepare FPC to determine the theoretical nutritional limit of FPC. This limit will be used as a standard for evaluating the actual processes developed by the contractors. Through the efforts of these laboratory organizations and the guidance of a panel of experts provided by the National Academy of Sciences, a wealth of information on this needed and valuable protein supplement will be available to other research groups and U.S. manufacturers of fish protein concentrate.

## Blue Crab Processing Machine Designed

Mechanization of blue crab processing is needed if its meat is to be competitive with other fishery products. Efforts are being made to devise machines that can reduce the amount of hand labor now necessary. A blue crab debacking and cleaning machine designed, under Department contract, by American Scientific Co., Inc., has shown promise in field trials. This machine, the first unit of a fully automated processing line, debacks and cleans the crabs at a rate of 40 to 60 per minute. The cost of the debacking and cleaning has been substantially reduced from the original estimate to a point that makes the machine attractive to a plant with a minimum of 10 to 12 pickers. On-the-job production testing of the unit was to continue throughout the 1963 season.

## Fish Oil Research Underway

Years ago fish oils were used in many industrial processes, such as in the preparation of soap, insecticides, foods, and paints; however, increased production by the vegetable oil industry and the advent of chemical detergents have drastically reduced domestic markets for fish oils. For the past several years foreign oleomargarine producers have been the chief users of domestic fish oils. Recently, the increased production of fishmeal and oilseed meals and the attendant increase in oil production resulted in accumulation of large stocks of these products, causing some alarm in the domestic fish oil industry.

New research of the Bureau of Commercial Fisheries seeks to utilize the unique chemical features of fish oils. For example, most vegetable oils are unsaturated at the end of the molecule while fish oils are unsaturated in the midpoint of the molecule. If specific chemical uses can be found for this characteristic, then other unsaturated oils could not replace fish oils in manufacturing processes.

## Radiation Preserves Fishery Products

Low-level radiation preservation holds great promise for the fishing industry. Commonly called radio pasteurization, it delays spoilage of refrigerated fresh sea foods by destroying large numbers of spoilage organisms normally present. Studies of its practicality are being made at Bureau technological laboratories in Ann Arbor, Mich., Gloucester, Mass., and Seattle, Wash.

Radio pasteurization studies showed that irradiated, skinless pollock and ocean perch fillets can be stored satisfactorily for 30 days at 33° F. Quality of ocean perch was slightly better than of pollock. Similar work completed on Dungeness crab meat and petrale sole fillets showed that the storage life of Dungeness crab meat can be extended to 4 to 6 weeks at 33° F. and the storage life of sole fillets to 5 weeks.

The Atomic Energy Commission has funds to build a $600,000 irradiator on land adjacent the Bureau's technological laboratory in Gloucester. To be known as the Marine Products Development Irradiator, this unit will be operated by Department fishery technologists. It will be used for semiproduction scale tests and to provide a volume of irradiation preserved fishery products for further scientific and marketing studies.

Small boats such as this Gloucester dragger shown unloading ocean perch are not always economical to operate.

## Exploratory Fishing Conducted

In meeting its responsibilities to the fishing industry, the Bureau of Commercial Fisheries conducts exploratory fishing in its constant search for new fishing grounds and ways of improving fishing gear.

Exploratory fishing along the Atlantic coast extended from off Nova Scotia to the northeast coast of South America, including the Caribbean Sea and Gulf of Mexico. In the North Pacific, operations ranged from the Gulf of Alaska to California, while in the Great Lakes area, efforts were concentrated in Lakes Michigan and Erie.

Two new shrimp grounds of commercial importance were discovered off the northeast coast of South America by the research vessel *Oregon*. Information about the new shrimp beds was relayed to the growing fleet of U.S. shrimp vessels operating out of various ports in the Guianas. Oceanographic and biological observations recorded during the *Oregon*'s cruise off South America were part of the Bureau's participation in the International Cooperative Investigations of the Tropical Atlantic.

During cooperative work with a vessel chartered by the Woods Hole Oceanographic Institution, several good catches of swordfish were made with longline gear off Cape Cod, Mass. This method was quickly adopted by commercial vessels and has resulted in a year-round fishery. Longline explorations of the research vessel *Delaware* extended from off New England to the Azores and provided additional information on the distribution of swordfish and various species of tuna.

In the Gulf of Alaska, the chartered fishing vessel *Yaquina* located commercial stocks of king crab in two areas near Kodiak Island. Both areas, one off Cape Chiniak and the other off Marmot Island, are closer to port than the established offshore commercial grounds. This discovery shortens trips and also adds new fishing areas.

In the search for improved types of commercial fishing gear, new pelagic trawls were designed, constructed, and tested. Off the west coast of the United States a giant pelagic trawl was used from the research vessel *John N. Cobb* and was found to have good commercial possibilities. It also proved extremely efficient as a gross biological sampling tool for fish at surface and midwater depths.

The possibility of using electricity to assist fishing was studied further. With equipment developed and supplied by private industry, researchers aboard the *Delaware* tested the effect of an

This trim, 150-foot tuna purse seiner was converted from a 148-foot cargo vessel that had been severely damaged by an explosion and fire. Under the fishing vessel mortgage program, the Federal Government insured over 75 percent of the total reconstruction and conversion costs.

electrical field in front of a New England-type otter trawl on its fish-catching efficiency. Preliminary results were considered excellent, with significant increases occurring in the catches of several species of fish when the electrical current was flowing. In the Gulf of Mexico, the *George M. Bowers* was used for experiments on electrofishing methods for shrimp.

## Economics Research Improved

Proper utilization of America's fishery resources does not depend entirely on the size of the fish stocks and U.S. fishermen's ability to harvest them. Of great importance to the industry is the role of economics. In a free economy a fishery must be profitable or it will cease.

Realizing that the knowledge of fishery economics must be augmented, the Bureau paid special attention to improving its research in this field. A committee of five non-Bureau economists reviewed the economics program of the Bureau of Commercial Fisheries and made recommendations on the appropriate structure and scale of economics effort in operations of the Bureau. The committee recommended that a Division of Economics be established and that basic research be undertaken to produce a meaningful flow of economics information.

Implementation of the committee's recommendations was rapid with the development of an effective commodity analysis program, a positive program for improvement of transportation rates and facilities, and an integrated program leading to the development and subsequent physical operational review of cooperative marketing associations in the domestic fisheries.

The economics work was divided into line and staff functions. The Central Office staff performs the staff or administrative management functions and the economics laboratory handles the line or field activities. An extensive recruitment campaign was conducted to employ qualified economists necessary to staff these operations. Work of reorganizing the Bureau's economics programs will continue in fiscal 1964 with the further training of personnel and development of the research and services program.

Cooperation was maintained with the Area Redevelopment Administration and project proposal and overall economic development plans (OEDP) involving commercial fisheries were reviewed. These increased about twofold during the year, with approval of 10 projects totaling $3,091,957.

Scientists, visiting a Bureau of Commercial Fisheries biological laboratory, view an enclosed pond containing an established marine community and radioactive substances. The cycling of the radioactive substances is observed by measuring the radioactive content of the plants, animals and water in the pond.

Several fishery commodity situation reports, basically for administrative use, were prepared on tuna, menhaden, shrimp, and groundfish. These reports were used in the Fish and Wildlife Service and Bureau of Commercial Fisheries in reaching administrative management decisions affecting the fishing industry. Future reports will cover salmon, scallop, crab, and oyster fisheries. Such reports analyze current conditions in these fisheries and provide management with the best information possible as an aid to decision making.

### Training Program Aids Research

One handicap to the rapidly developing oceanographic and fishery program in the United States has been the shortage of qualified scientists. To help alleviate this need, a fund for graduate education grants was established in 1962. During the 1962–63 school year, 17 students were supported at 12 universities. The students pursued studies and research in some aspect of basic marine science. In addition, the Bureau continued its policy of encouraging and supporting further specialized training for its scientists, technicians, and administrators.

## SERVICES PROVIDED INDUSTRY

The program of the Bureau of Commercial Fisheries includes several services to the fishery industry. These are provided because one of the responsibilities of the Department of the Interior is to strengthen and maintain a vigorous fishery industry. In fiscal 1963, this assistance included the following activities:

### Market Promotion and Consumer Education Provided

In line with its duty of promoting and expanding the use of domestically produced fishery products, the Bureau of Commercial Fisheries continued its aggressive marketing program. The program has close cooperation with the domestic fishing and allied industries and with State and Federal agencies concerned with resource utilization.

The Maine sardine industry—faced with heavy inventories, depressed prices, little market demand, vastly increased imports, and heavy landings—requested assistance from the Bureau, which responded with a consumer and food-trade education program. More than 30 food-trade associations were asked to assist the Maine sardine industry. Contacts also were made with home economists, dietitians, school lunch supervisors, in-plant feeders, and

Large numbers of high school and college biology students visit the Department's biological laboratories each year as part of their studies of fish and shellfish resources.

representatives of radio, television, and newspapers. As a result, the Maine sardine market was considerably strengthened.

The Bureau received a request for marketing assistance from the natural sponge industry at Tarpon Springs, Fla. In the retail market, synthetic sponges have largely displaced the natural sponge. Again the Department, through its Bureau of Commercial Fisheries, responded to an industry request for marketing assistance by planning a joint pilot marketing and promotional program scheduled to begin in October 1963.

Other industrywide promotional efforts also engaged marketing specialists. To stimulate seafood use both by homemakers and institutions, public-service-type consumer educational materials were distributed nationally to newspapers and magazine food editors, radio and television public service directors, extension specialists, the mass-feeding industry, retail food trade, and others in a position to publicize and merchandise fishery products. Marketing personnel worked with food-chain merchandisers, industry-paid advertising agencies, and other cooperators in developing advertising, merchandising, and promotion programs to full advantage of various promotional opportunities.

Industry was assisted during the past year in the following promotional programs:

"National Fish and Seafood Parade," "The Wonderful World of Tuna," "The Chive Festival," "August Is Sandwich Month," Fifth International Food Congress, "Fish 'n Seafood Time," Maine Seafood Festival, New Bedford Scallop Festival, and the special promotions on Maine sardines and natural sponges.

Conventions in which the Department sponsored fishery educational exhibits of the Bureau included the Fifth International Food Congress, American Dietetics Association, American Home Economics Association, American School Food Service Association, National Restaurant Association, and various regional food conventions throughout the Nation.

### Motion Pictures Distributed

Twenty fishery educational motion pictures, produced by the Bureau of Commercial Fisheries and mostly industry financed, were given national distribution through 200 cooperating film libraries and government distribution channels. The films were seen by over 2 million persons. The major portion of the latest motion picture, "Watermen of Chesapeake," was completed. This picture is scheduled for release before the end of 1963. Since 1946, 21 international and national film festival awards have been presented to the Department as the result of Bureau-produced films.

### Fish Cookery Demonstrations Presented

As part of a continuing program to promote the greater use of seafoods in the American diet, Department home economists presented over 250 fish cookery demonstrations for television food shows, restaurant operators, institutional dieticians, school lunch managers, in-plant feeders, extension agents, and club leaders. It conducted more than 500 palatability tests in developing kitchen-tested recipes for consumer use.

### Market News Reporting

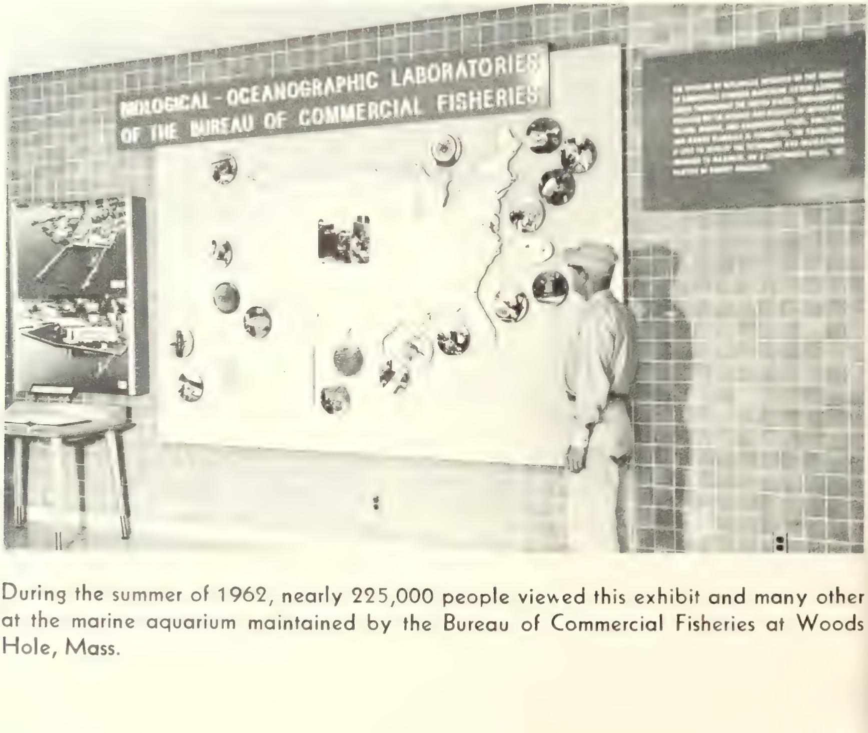
For a quarter of a century the Bureau's Fishery Market News Service has provided the fishing industry of the United States with current information on supplies, movement, distribution, demand, prices, and market conditions. Daily reports were issued in seven important fishing centers. They provided better understanding between buyers and sellers at every point in the marketing chain from fisherman to consumer.

Special articles and news of fishery trends and developments in all phases of fishery research in the United States and abroad were presented in the monthly periodical, "Commercial Fisheries Review."

News of trends and developments in foreign fisheries, transmitted by the Department of State from foreign reporting posts, were published in the daily Fishery Products Reports and Commercial Fisheries Review. More detailed reports on foreign fisheries were distributed to U.S. fishing interests upon request.

## Inspection and Standards Improve Quality

To improve the quality of seafoods, fishery product inspectors in the Department's voluntary Inspection and Certification Program examined and certified about 210 million pounds of fishery products during the past year. This work, paid for by the users of the inspection service, was by well-trained Federal inspectors. Forty-three fishery product processing plants contracted for voluntary U.S. Department of the Interior continuous inspection during the year. The services of the inspectors also were available to anyone at nine Bureau lot inspection offices conveniently located throughout the country.


BIOLOGICAL-OCEANOGRAPHIC LABORATORIES
OF THE BUREAU OF COMMERCIAL FISHERIES

During the summer of 1962, nearly 225,000 people viewed this exhibit and many other at the marine aquarium maintained by the Bureau of Commercial Fisheries at Woods Hole, Mass.

The U.S. standards for grades of fishery products serve as yardsticks by which the inspection service measures the quality of fishery products. Twelve U.S. fishery product standards are now available for use. Two new standards were published in fiscal 1963 and three existing standards were being revised.

## Statistical Reporting Helped

Installation of more sophisticated data-processing equipment made it possible, for the first time, for the Bureau of Commercial Fisheries to use detailed Bureau of the Customs vessel data in assembling information on the age of the U.S. fishing fleet by State, area, and type of vessel. The information revealed that much of the U.S. fishing fleet is outdated. Of the 7,142 vessels in the Atlantic and Gulf fleet, 1,697 were built before 1940. The Pacific fleet consists of an even greater proportion of older craft. Of the 4,740 vessels operating in California, Oregon, Washington, and Alaska, 1,800 (or 38 percent) were built before 1940. The oldest vessel in the U.S. fleet was built in 1865—nearly 100 years ago.

Because of increased interest in the domestic consumption of fishery products, a survey was undertaken during the year to determine current and historical information on U.S. per capita consumption of fish and shellfish by major species and type of product. The study revealed that consumption has remained remarkably constant during the past 30 years, averaging 10 to 11 pounds, edible weight basis. Consumption of such items as canned tuna, groundfish fillets and blocks, and most shellfish, except oysters, has increased sharply; however, consumption of canned salmon and Pacific sardines and fresh and frozen oysters has declined.

In 1961, the year covered in the study, nearly half the cured products consumed were imported, while 43 percent of the fresh and frozen items and 39 percent of the canned products were of foreign origin.

## Financial Assistance Given Fisheries

Three programs of financial assistance to the commercial fishing industry continued during the year.

The Fisheries Loan Fund, authorized by the Fish and Wildlife Act of 1956, financed 21 replacement vessels and provided loans to 34 other vessel owners who could not obtain funds on reasonable terms from other sources. The loans were for repairs, equipment, and maintenance of vessels and gear. Total loans for the year were $827,000. Over $15 million has been loaned fishermen since the program began.

Under the Fishing Vessel Mortgage Insurance program, 11 contracts for $779,619 were issued during the year; 10 contracts for $1,349,366 were outstanding from previous years; and 7 applications for $1,357,665 were pending. Forty new fishing vessels are involved.

The Fishing Vessel Construction Differential Subsidy program under Public Law 86–516 expired June 12, 1963. Six applications had been approved for $546,102, and seven were pending for $55,667. The purpose of the program was to provide financial assistance to those who wished to build fishing vessels in the United States, where construction costs are nearly twice those in foreign shipyards. The subsidy corrected the inequity between foreign and domestic costs of fishing vessel construction.

## FISHERY EDUCATIONAL ACTIVITIES CONTINUE

At many of the laboratories, bases, and offices of the Bureau of Commercial Fisheries, special attention was given to educating the public in general conservation activities of the Department and in the work performed by it in oceanography and the fisheries. Open houses for the public were held by some installations. In several laboratories special aquarium exhibits drew hundreds of thousands of visitors. Many Bureau seminars were open to the public, and often special programs were presented for high school and university classes.

The contact with university students and faculty members was particularly important because they are the source of our new scientists and technicians and also are inclined to be the most effective advocates of conservation.

## DEVELOPMENTS IN FOREIGN FISHERIES AND TRADE

The U.S. fishing industry competes with other fishing nations, not only for the harvest of fish in the sea but also for a share of the world market. Information on the fishing activities of other countries must be available if the United States is to operate successfully in the competition for these resources and the markets. During fiscal 1963, the Department's Bureau of Commercial Fish-

Bureau of Commercial Fisheries scientists haul spiny lobsters aboard the research vessel Pelican while assisting the Republic of Panama in its studies of this important shellfish resource.

eries collected such information and made it available to industry and government.

## Foreign Fishing Activities Increase

World fisheries continued to increase in 1963. Their landings have doubled since 1950 and they established a new record of 41,200,000 metric tons in 1961. Figures for 1962 were not yet available at year's end, but another record catch was anticipated. This increased production has created problems for the U.S. fishing industry in the areas of resource management, resource development, competition on the high seas for important commercial species, and in domestic and international trade.

The Department continued to achieve wider coverage of foreign fishery developments to meet industry and government requests and needs for foreign fishery information. Information obtained enabled American firms to find market outlets for their fishery products in foreign countries, to evaluate fishery investment opportunities in various countries, and to meet competition in domestic markets. Such information also was most useful in determining U.S. policy regarding problem areas.

Three regional fishery attachés—in Copenhagen, Mexico City, and Tokyo—continued to report on fishery developments from Europe, Latin America, and Japan. Specialized data on costs of construction and operation of foreign factoryship stern trawlers were obtained from Copenhagen. A report was prepared on a survey of the shrimp fisheries of Guatemala, El Salvador, and Nicaragua.

U.S. industry was kept advised of fish meal and oil developments in Peru and throughout the world. A new fishery attaché post in Abidjan, Ivory Coast, was approved by the Department of State. It should improve fishery reporting from the west and south African area.

The Department of the Interior also followed closely the activities of foreign craft off the U.S. coasts. Locations and activities of Soviet fishing fleets and exploratory fishing vessels were reported regularly. In addition, current reports covering Soviet, Japanese, and African fishery developments were released.

## International Programs Grow

Participation of the Department in international fishery affairs increased in 1963. Two new regional fishery commissions were established under FAO sponsorship, one in the west African area and the other in the southwest Atlantic area.

The Regional Fisheries Commission for west Africa held its inaugural session at Tunis, Tunisia, in November. The United States, because of its interest in African fisheries development, sent a Department observer and a fishing industry adviser to Tunis.

The inaugural session of the Regional Fisheries Advisory Commission for the southwest Atlantic was held at Rio de Janeiro, Brazil, in December. The United States, keenly interested in establishment of successful fishery commissions in this area, both from the viewpoint of regional economic development and in the interest of the U.S. fishery industries, also sent a Department and an industry representative to Rio de Janeiro.

The Department, through the U.S. FAO Interagency Committee, participated in June in the U.S. hostship of the FAO-sponsored World Food Congress in Washington, D.C., and also represented the Federal Government in activities of the Fisheries Division of FAO.

United Nations Special Fund projects for fishery development in Caribbean and Central America areas are being developed. The Department recognizes the feasibility of these projects and may eventually participate by providing manpower and technical assistance. Bureau technical experts were sent to Colombia and Brazil to advise on commercial fishery developments. A specialist in exploratory fishing was instrumental in locating commercial quantities of spiny lobster resources off the east and west coasts of Panama and in assisting the local government and industry develop these resources.

Officials of the Bureau of Commercial Fisheries continued to participate in international commissions concerned with aquatic resources and their utilization. These commissions include the Inter-American Tropical Tuna Commission, International Commission for the Northwest Atlantic Fisheries, International Pacific Halibut Commission, International Whaling Commission, Great Lakes Fishery Commission, North Pacific Fisheries Commission, and North Pacific Fur Seal Commission. At commission meetings, every effort is made to provide for wise exploitation of the resources, along with safeguarding the traditional rights of U.S. fishermen.

## Trade and Tariff Studied

Specialists in trade and tariff matters in the Department's Bureau of Commercial Fisheries assisted in developing policies designed to move U.S.-produced fishery products in domestic and foreign markets. The Trade Expansion Act of 1962 had granted the President broad authority to enter into trade agreements with other countries during the 5-year period ending June 30, 1967. Preparations for coming tariff negotiations with the European Common Market and with other members of the General Agreement on Tariffs and Trade began in fiscal 1963 and a Department representative was detailed to work with the Office of the Trade Agreements Negotiator.

The Department was represented by the Bureau at the second United States-Japan Tuna Conference in Tokyo, October 1962. Frank exchanges of views and a better understanding of the problems relating to trade in tuna and to the expanding utilization of the resource resulted from this conference.

## International Tuna Conference Held

The United States was host to the FAO World Scientific Meeting on the Biology of Tunas and Related Species in July 1962. This meeting was attended by 249 scientists and industry members from 18 countries and 8 international organizations. Bureau scientists played a major role in planning the conference, which was concerned with the status of present biological knowledge of these fishes and the need for further information in the future. The tunas represent a worldwide resource of tremendous importance, and their conservation is a matter of international interest. The meeting focused attention on tuna problems and encouraged further research and cooperation among the nations that harvest them.

## COLUMBIA RIVER DEVELOPMENT PROGRAM EMPHASIZES SALMON

Extensive Federal water-use developments in the Columbia River Basin led to start of a program in 1949 known as the Columbia River Fishery Development Program. Fishery agencies felt that such a program was needed to maintain the valuable and world-famous migratory salmon and steelhead runs that might be damaged by the water-use developments. The Department, through its Bureau of Commercial Fisheries, is responsible for coordinating and administering this cooperative program, which involves the fish and game agencies of the States of Idaho, Oregon, and Washington.

Since inception of the program, obstructions have been cleared from streams to permit passage of fish, fishways have been constructed at natural falls, and screens have been placed at points of irrigation diversion to prohibit entry of fish in those diversions. Hatcheries and other artificial propagation facilities for salmon have been constructed and operated to replace lost habitat, and studies have been developed to improve management procedures and evaluate various facets of the program.

During the past year the success of the Columbia River program was demonstrated by an exceptionally fine run of steelhead that returned to the Eagle Creek National Fish Hatchery in Oregon and by a large run of spring chinook salmon that used the Shipperd Falls Fishway on the Wind River in Washington and returned to the Carson National Fish Hatchery upstream. Some 13 million spring chinook salmon eggs, 75 million fall chinook salmon eggs, and 52 million silver salmon eggs were taken at hatcheries connected with the Columbia River program. The take of silver salmon eggs was the highest on record and resulted from an unusually large run of silver salmon in the lower Columbia River.

Evaluation of the contribution of hatcheries to maintenance of the river's salmon resources continued with the marking and release of approximately 7 million juvenile salmon.

The screening of irrigation diversions continued during the year, more than 500 screens being operated in Oregon and Idaho. A total of 34 new screens was constructed and placed in the Salmon River drainage, Idaho, thus bringing to 165 the number of screens operating in that drainage. Many of the young fish saved from irrigation diversions will return later as adult fish.

Eventually improvement in production of fish is being sought, in part, by operational studies. Some 28 investigations were underway during the year, embracing improvement of natural habitat, predator control, natural rearing, and improvement in fish cultural techniques. Five State fish and game agencies, three universities, and several research groups of the Department's Fish and Wildlife Service participated in the studies.

Good progress was made in studies regarding rearing of fish in natural or seminatural ponds, production of young fish in artificial incubation channels, and physiological changes associated with seaward migration of the young fish. A salmon compendium, a monumental compilation of all salmon literature by subject pub-

This fish screen prevents entry of young fish into an irrigation diversion on the North Fork of the Salmon River near Salmon, Idaho, where they soon would be stranded and die.—Courtesy Idaho Department of Fish and Game.

lished since 1900, was nearing completion. Thus far 108 volumes have been written.

A new major fishway was completed on the Lostine River in Oregon. This fishway aided passage of adult migrant salmon and steelhead upstream to areas suitable for spawning. Fishways constructed in the past in Idaho, Oregon, and Washington were operated successfully during the migration seasons.

Extensive assistance in planning and inspection of fish passage and protective facilities was given various government agencies and private power companies. Good progress was made in planning fish facilities at new projects and in negotiations for improving passage facilities and their operation at dams. The effects of water development projects upon fish may be extensive and were carefully analyzed. During the year, 309 water resource development projects of a size that they might affect fisheries resources were investigated and reported.

## FUR SEAL OPERATIONS

In administering the U.S. fur seal industry, the Department harvested 77,915 sealskins during the summer of 1962 from the Pribilof Islands, Alaska. Under the Interim Convention on Conservation of North Pacific Fur Seals, Canada and Japan each received 15 percent of the sealskins taken, plus 375 additional skins.

During fiscal 1963, 54,820 U.S.-owned sealskins were sold, grossing $3,566,764. Under the Alaska Statehood Act, 70 percent of the net proceeds from the sale of sealskins is payable annually to the State of Alaska. The fourth annual payment to the State, based on net proceeds accruing during fiscal 1962, was made late in 1962. It totaled $702,852.

The contract for the processing and selling Alaska sealskins for the Federal Government, held by the Fouke Fur Co. for 40 years, was terminated December 31, 1962.

In June 1962 the Department invited proposals for processing and selling Alaska sealskins. They were distributed to many fur-processing firms, individuals, and organizations. In March 1963, the Department awarded a contract for processing and selling such sealskins harvested to Supara, a joint venture partnership in Chicago, Ill. The firm will locate its processing plant in St. Louis, Mo.

Loss of large numbers of pup seals during the past several years was of considerable concern to biologists of the Bureau of Com-

The fishery-oceanographic vessel Albatross IV is one of the world's most modern research ships.

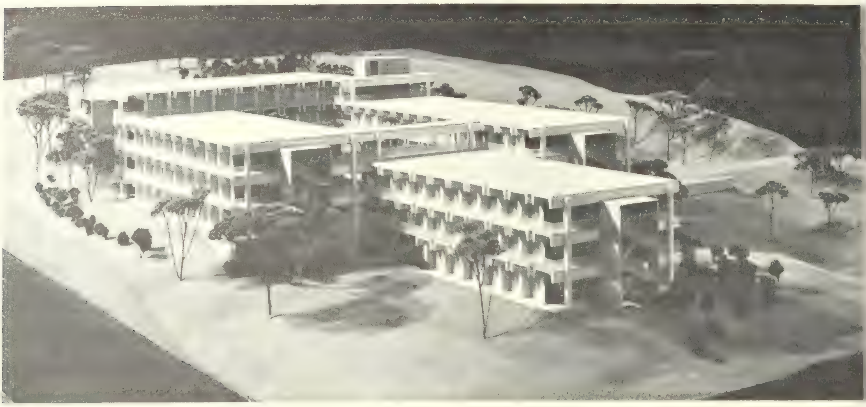
mercial Fisheries, and the object of intensive research. Intestinal infections from hookworms appear to be the major factor in the losses. Research at Colorado State University revealed that newly born pups are infected with hookworm larva they ingest with milk of their mothers when nursing.

## CONSTRUCTION ACTIVE

The construction program provided the Bureau with new research tools. One new research vessel was completed, one vessel was converted to fishery purposes, and contracts were let for two new ships. Construction of a new laboratory started.

### New Research Ships Operate

One of the world's most modern fishery-oceanographic research vessels began operating in the northwest Atlantic. The 187-foot, 1,000-ton sternchute trawler, *Albatross IV*, fully equipped with the latest underwater TV, underwater sonar, and experimental fishing



This scale model represents the Bureau's new fishery-oceanographic research laboratory to be located on the northern boundary of the Scripps Institution of Oceanography or and deeded to the Government by the Regents of the University of California.

gear, is based at the Department's Woods Hole, Mass., biological laboratory. The new vessel will help accelerate needed research in the northwest Atlantic region, where an intense fishery by many nations is taking an increasing toll of the resources.

A 147-foot surplus Navy vessel was converted to a fishery-oceanographic ship, the *Geronimo,* which began operating during the year. Urgent need for a ship to participate in investigations of the tropical Atlantic eliminated the possibility of waiting for a new ship to be built.

Designs for two new research vessels were completed and contracts were awarded for their construction. One ship will be the *Townsend Cromwell,* a 158-foot vessel to be used for oceanographic and tuna research in the central Pacific. The other, to be called the *David Starr Jordon,* will be a 171-foot ship for use in the eastern Pacific in oceanographic investigations and studies of anchovy, jack mackerel, tuna, and related species.

## New Laboratory Started

A ground-breaking ceremony was held in June 1963, marking the start of construction of a $2½ million laboratory on the campus of Scripps Institution of Oceanography in California. This laboratory will provide a greatly improved working environment for the Department's fishery research staffs in the southern California area and will constitute one of the major fishery research centers in the United States.

# Office of the Assistant Secretary Mineral Resources

### John M. Kelly, Assistant Secretary

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Minerals, basic to every nation's economy, are essential both for America's conquering outer space and for creating an environment in which America's "inner space" may be conserved and enjoyed. Interior's responsibilities for research, development, and utilization of minerals center in the Office of the Assistant Secretary for Mineral Resources.

In fiscal 1963, policy and program organization and liaison were expedited in several areas of increased public interest, including oil shale development proposals for the Rocky Mountain region, Area Redevelopment Administration plans involving mineral resources, a demonstration program for rehabilitating strip mine areas, and acid mine water pollution problems.

Following two major coal mine disasters, and at the request of the President, a study of coal mine safety was started. Consultations were held with mine safety officials of several States and with labor and management organizations. At year's end, recommendations for legislative and administrative action to improve coal mine safety were being completed.

The office, together with the office of the Administrative Assistant Secretary and the Bureau of Mines, planned the reorganization of the Bureau. This was being put into effect as the fiscal year closed.

In cooperation with other executive agencies, the Department revised the program of import controls for petroleum and petroleum products to assure its fullest contribution to national security.

Wise development of the Nation's wealth of mineral resources will insure their continued abundance.

Heightened congressional and executive branch interest in water quality and water research was reflected in the leadership and coordination work of the office, in conjunction with other areas of the Department.

A noteworthy report, "Supplies, Costs, and Use of the Fossil Fuels," received worldwide distribution. The report was produced by the Departmental Energy Policy Staff, jointly created by the Assistant Secretaries for Water and Power Development and Mineral Resources. At year's end the Energy Policy Staff was coordinating the Department's participation in the Interdepartmental Energy Study requested by the President.

Reports on mineral resources for both the National Academy of Sciences and the Federal Council on Science and Technology were completed. The Assistant Secretary and a staff member participated in the Princeton Conference on Mineral Exploration and Development.

Precedent-setting sessions were held with representatives of several metal commodity industries and the petroleum industry to exchange briefings and background information on problems regarding specific minerals.

Department contacts with the Interstate Oil Compact Commission resulted in a Commission study of petroleum conservation practices.

During 1963 the worldwide ramifications of mineral policies attracted increased attention in the Assistant Secretary's office because of their effects on domestic mineral resources. Involved were such special or continuing projects as—

> . . . Participation in the Organization for Economic Cooperation and Development, through its Energy, Coal, Oil and Non-Ferrous Metals Committees;
>
> . . . Extensive discussions, in cooperation with the Department of State, with representatives of foreign governments on matters regarding fuels;
>
> . . . Organization and presentation of the U.S. contributions on minerals and related subjects before the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas;
>
> . . . Participation in the work of the NATO Petroleum Planning Committee;
>
> . . . Representation at meetings of the International Lead-Zinc Study Group and its standing committee—of which a member of the staff is chairman—and participation in meetings of the Special Working Party of the Study Group;

. . . Continuation of work aimed at expanding the market for export of U.S. coal—an activity which was marked by a substantial rise in coal exports during the year;

. . . Guidance for U.S. participation in minerals and geologic activities of the Economic Commission for Asia and the Far East;

. . . Participation in special United Nations consultations on tungsten;

. . . Preparation, together with the Resources Program Staff, of departmental material for use in implementing the administration's trade program.

Other work of the Assistant Secretary's office involved the continuing supervision of organization and programs of eight bureaus and offices of the Department: The Geological Survey, Bureau of Mines, Office of Oil and Gas, Office of Geography, Office of Minerals and Solid Fuels, Office of Minerals Exploration, Oil Import Administration, and Office of Coal Research.

# Geological Survey

Thomas B. Nolan Director.

In February 1963, nearly 2,000 delegates from more than 80 nations gathered at Geneva to discuss natural resource conservation and development.

It was the first major international effort to mobilize the world's scientific and technical knowledge to stimulate the economic and social progress of developing areas.

The assembly reflected, in a sense, a "return to earth" of scientific inquiry if seen as a counterbalance to the dramatic advances in the exploration of outer space. Geological Survey earth, water, and mapping scientists who presented papers at the international gathering emphasized that the strength and wealth of any nation is built on its properly surveyed, developed, and researched natural resources—a truism regarding the United States as well as for the most newly emerged sovereign nation.

In 1963, the Geological Survey's research on natural resources reached new highs, accentuating the link between the Nation's well-being and its natural resources, of which land and water are vital.

The Survey has been asked: "Why are your research efforts on natural resources always increasing? Shouldn't phases of our resources inventory terminate?"

The questions are based on a common misconception: that a resource is a fixed quantity and hence is exhaustible according to a predetermined schedule. The fact is that most resources are practically as limitless as man's imagination, ingenuity, skill, and knowledge permit. Resources used by man are created largely by human inquiry—by research that finds new uses for previously valueless materials, that finds resources that could not be found before, and that provides ways to extract and refine materials that formerly could not be exploited profitably. Prospectors, geologists—or Indians—during an earlier era of American history did not seek uranium deposits in the Rockies, ground-water supplies beneath the plains, or oil beneath the Williston Basin, because of a lack of need. But even if these substances had been sought, most of them would not have been found, because the knowledge needed for wise and successful prospecting was still undeveloped.

The quest for knowledge about our resources must be a never-ending one. And, because our population and per capita consumption of raw materials and energy are growing, we must increase our research to meet the Nation's aims of economic growth.

The Geological Survey has chief responsibility for determining the distribution and quality of the Nation's water resources, minerals, and fuels; for surveying and mapping the land surface; for establishing, by mapping and other studies, the character and structure of the rocks that underlie the surface; and for supervising the development of fuels and minerals on Federal lands under leasing laws.

In its investigations, the Survey always seeks the competence and knowledge necessary for the long-range development, management, and wise use of all types of natural resources, whether these resources be on the continents or in the subocean crust.

The theme, "Conservation Through Research," can be found throughout the Survey's accomplishments for 1963.

## WATER RESOURCES DIVISION STUDIES ESSENTIAL

Through its Water Resources Division, the Survey's function is to assess the Nation's total water resource and to find out more about water itself. Wise management of water resources requires a fundamental understanding of the water system and all its processes, including the relationship between surface and subsurface systems, between flowing streams and storage reservoirs, and between water quality and geologic environment.

Water resources cannot be managed wisely unless we know how much water circulates through rivers and aquifers and how much is being withdrawn for use. Those responsible for water management depend largely upon the Survey to provide the facts and research findings on which new management techniques can be based.

Water investigations by the Survey fall into three general categories: a network of thousands of stations for measuring and evaluating the water resources of the country; interpretive studies of areas of existing or potential water problems; and research on hydrology. Armed with current water facts and with scientific understanding of water occurrence and quality, the Survey can help the States and the Nation manage water resources with prudence and foresight.

## Cooperative Program Helps States

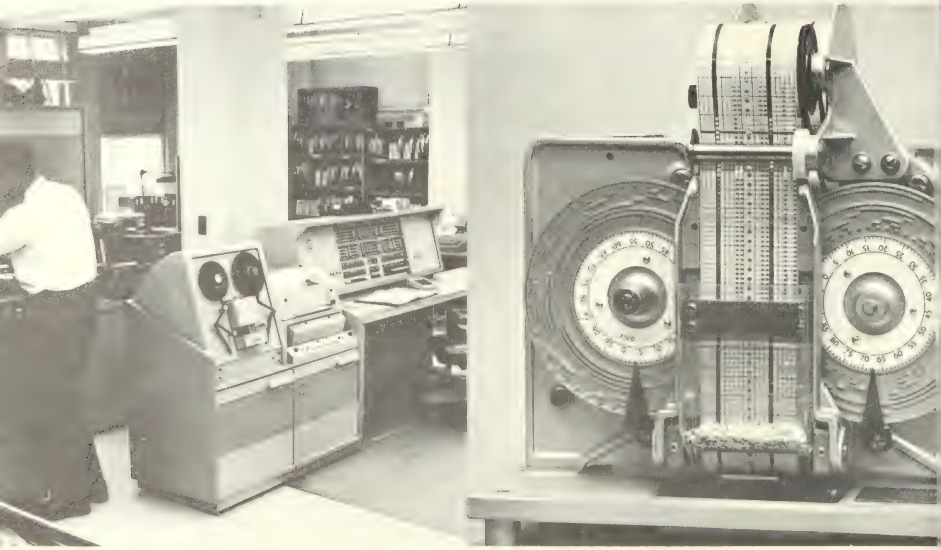
Since its inception, the Geological Survey has maintained a close relationship with the States. This Federal-State cooperation has grown steadily and now constitutes about 55 percent of the total water resources investigation conducted by the Survey.

As shown in the accompanying table, the Survey cooperates with State and other Government units in water resources investigations on a matching-funds basis.

Work is performed chiefly in cooperation with State engineers and State geological surveys, but cooperative projects also are undertaken with State conservation departments, highway departments, water and power boards, fish and game departments, and public health departments. Counties, cities, educational institutions, and water users' organizations also, from time to time, cooperate in the Survey water program. Such cooperation promotes local initiative and interest in regional water situations, so important to the solution of local water problems.

*State and municipal offerings for water resources investigations*

| STATE | 1963 | STATE | 1963 |
|---|---|---|---|
| Alabama | $143, 507 | Montana | $95, 037 |
| Alaska | 48, 044 | Nebraska | 126, 597 |
| American Samoa | 7, 500 | Nevada | 115, 960 |
| Arizona | 303, 008 | New Hampshire | 31, 595 |
| Arkansas | 102, 365 | New Jersey | 218, 672 |
| California | 830, 428 | New Mexico | 236, 016 |
| Colorado | 221, 681 | New York | 378, 798 |
| Connecticut | 105, 395 | North Carolina | 313, 288 |
| Delaware | 51, 767 | North Dakota | [illegible] |
| District of Columbia | 3, 500 | Ohio | 191, 228 |
| Florida | 395, 913 | Oklahoma | 119, 790 |
| Georgia | 194, 401 | Oregon | 137, 966 |
| Guam | 12, 000 | Pennsylvania | [illegible] |
| Hawaii | 215, 072 | Puerto Rico | [illegible] |
| Idaho | 98, 194 | Rhode Island | [illegible] |
| Illinois | 137, 771 | South Carolina | [illegible] |
| Indiana | 200, 564 | South Dakota | [illegible] |
| Iowa | 161, 055 | Tennessee | [illegible] |
| Kansas | 253, 681 | Texas | [illegible] |
| Kentucky | 160, 074 | Utah | [illegible] |
| Louisiana | 310, 837 | Vermont | [illegible] |
| Maine | 39, 577 | Virgin Islands | [illegible] |
| Maryland | 83, 236 | Virginia | [illegible] |
| Massachusetts | 115, 610 | Washington | [illegible] |
| Michigan | 154, 097 | West Virginia | [illegible] |
| Minnesota | 103, 557 | Wisconsin | [illegible] |
| Mississippi | 93, 413 | Wyoming | [illegible] |
| Missouri | 78, 183 | | |
| | | Total | [illegible] |



A hydraulic engineer uses the Survey's general-purpose computer to process streamflow records. The automation process starts with the newly developed digital recorder (above right) which produces a continuous record of river stage punched on paper tape later translated by machine into computer tape eliminating hand computations.

## Significant Achievements in Water Resources

Progress toward automation of streamflow records was an important achievement in fiscal 1963. Nearly 1,000 gaging stations have been automated, and more stations will be automated in the near future. Based on 10 years of research, the system uses digital recorders, translators, and an electronic computer to permit "gage to page" processing of streamflow records.

The first seven hydrologic "benchmark" stations were installed in 1963. They are in Texas, Ohio, New York, Missouri, North Carolina, Tennessee, and Colorado, in areas where water resources have not been, and hopefully will not be affected by the works of man. This network will permit assessment of changes occurring as a result of the vagaries of climate and other natural factors, and it also will provide a frame of reference against which hydrologic changes induced by man's activities may be evaluated.

About 50 Survey engineers and chemists from four States and Washington, D.C., participated in a complex data collection effort on the tidal estuary of the Delaware River. This information, to be processed by electronic computer, will be used in pollution studies.

A special project was set up to develop emergency water supplies for Guantanamo Naval Base in Cuba. Holding structures to induce recharge of the ground-water reservoir from rainfall were constructed and are working well. Aquifer tests were conducted to determine the extent of the water available and to help evaluate possible methods of improving supply.

A small-diameter bore-hole television camera for geologic and hydrologic exploration work was designed and constructed. This camera offers many advantages over those previously used. It allows scanning up to 147 degrees and is one through which the operator has complete control over the field of vision. Geologic and hydrologic condition of materials penetrated by wells may be observed in place at depths up to 1,000 feet.

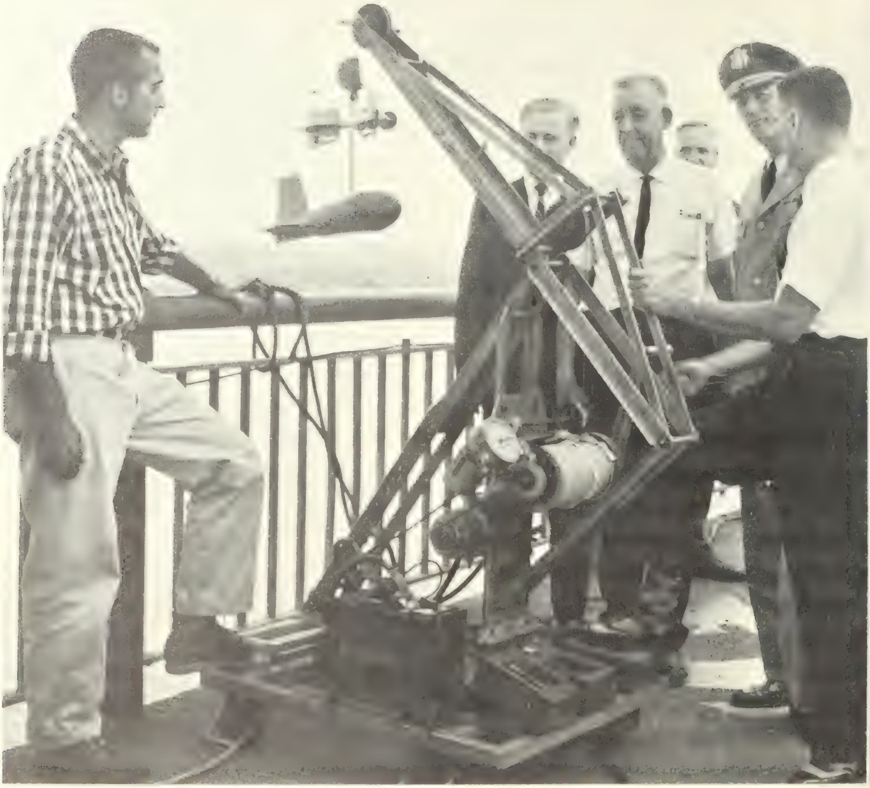
## Basic Data Collection Speeded

Basic data are the raw materials with which all water management, whether by State or Federal agencies, has to work. In 1963 basic data collection comprised about 50 percent of the total program. The amount of work done in basic data collection increased about 25 percent from 1956 to 1963.

Streamflow and other surface-water facts were obtained at more than 7,500 continuously recording sites in the 50 States, Puerto Rico, Guam, and Samoa. In addition, partial records at more than 5,500 sites were collected to provide additional information on floods and droughts. Collection of streamflow data is rapidly being automated. To make the basic streamflow information more promptly available to the public, a system of issuing annual streamflow reports by States was started. In 1963, reports for the first year, 1961, were completed as well as several for 1962.

During 1963, a network of about 3,500 privately and publicly owned wells were monitored for changes in ground-water conditions. Measurements of depth to water and samples of water were collected continuously or periodically to assess changes in ground-water conditions produced either by natural causes or by man's development of the water. Several thousand additional wells were measured in conjunction with project investigations.

The water quality basic data network included 1,372 river-sampling stations throughout the United States and Puerto Rico. Chemical quality was measured at 942 of these sites, sediment concentration and loads at 306 sites, and water temperature at 1,127 locations.



Geological Survey engineers explain the operation of equipment used to measure the streamflow of the tide-affected Delaware River. Streamflow and other hydrologic data, measured continuously for a complete tide cycle, are used in a variety of engineering studies.

## Interpretive Studies Progress

As part of its continuing program for mapping flooded areas, the Survey published 11 new hydrologic investigations atlases that show areas inundated at Columbus, Warren, and Youngstown, Ohio; Mount Clemens, Mich.; Bayamon-Catano, P.R.; Des Moines, Iowa; Atlantic City, N.J.; Wichita, Kans.; Arlington Heights and Elmhurst, Ill.; and Tampa, Fla. Flood-inundation maps covering 12 metropolitan areas in 4 States were nearing completion and work was in progress on 17 additional flood-inundation maps.

Flood-frequency analyses, parts of a nationwide study, were continued in fiscal 1963. Work started on reports covering four other basins and reports were published during the year for areas covering Utah, New Mexico, Kentucky, Georgia, and southeastern Michigan.

Compacts for apportioning interstate waters usually include provision for measurement of streamflow by the Geological Survey. Seventeen such agreements are in effect and eight others are under negotiation. In addition, water-resources investigations progressed along the Canadian border as required by the Boundary Water Treaty of 1909.

Work in 46 States advanced on over 500 ground-water projects during the year. Geologic and hydrologic conditions were studied in project areas concerned with problems such as salt-water encroachment, changes in chemical character resulting from waste disposal, and the balance between development and availability of ground water.

## Advances Counted in Water Research

The early requirements for water were simple: Where is the water and how much is available? However, as a gigantic national industrial structure has developed, water problems have become much more complex. Questions about water supply and quality have arisen for which there are no immediate answers because the scientific principles are not sufficiently understood or have not yet been established.

Modern electronics has helped solve many problems that resist ordinary analytic techniques. Based on the similarities between the behavior of fluid flow and electric-current flow, an electric analog model was constructed to simulate rainfall, drainage basin characteristics, and flood runoff. Determination of flood frequency is a specific objective, but other basic hydrologic relationships also will be studied.

Gross annual evaporation from exposed water surfaces in the 17 Western States has been estimated to be greater than 23 million acre-feet. Reduction of this evaporation loss would mean an increase in the available water supply. A research project underway seeks to develop practical methods of measuring evaporation loss and reducing evaporation from open water surfaces. Plastic films spread on the water and the injection of air to eliminate thermal stratification were two of the methods tested in 1963 with encouraging, but not conclusive, results.

Collection of information on peak streamflow is difficult in arid regions where flashy runoff occurs in normally dry gullies. A radar system was designed to track the movement of clouds and locate areas receiving rainfall. This information then can be used to direct stream gagers to the scene of rainfall for collecting facts on stream discharge.

This small diameter TV camera is used for subsurface geologic and hydrologic exploration.

An investigation is underway in the Potomac River Valley of Maryland and Virginia to determine the dates of historical floods and to establish flood-frequency patterns by observing effects on trees and shrubs in the flood plain.

Time-of-travel measurements with Rhodamine B and sensitive fluorometers were made on many streams. This new activity supplied needed information for studies of stream pollution.

A recent development in the direct recording of streamflow is the acoustic velocity meter. Successfully tested in 1963 after several years of work, the system generates a large-amplitude sound wave and records the time it takes the wave to travel to the opposite bank and return. The cycle is repeated continuously, and the recorded data are used to compute the mean velocity of the stream for each cycle. Cost of the equipment probably will limit its use to special projects.

Water Resources Division chemists collect water samples from the Delaware River. Analytical equipment for determination of dissolved oxygen and specific conductance is in the background.—Courtesy City of Philadelphia.

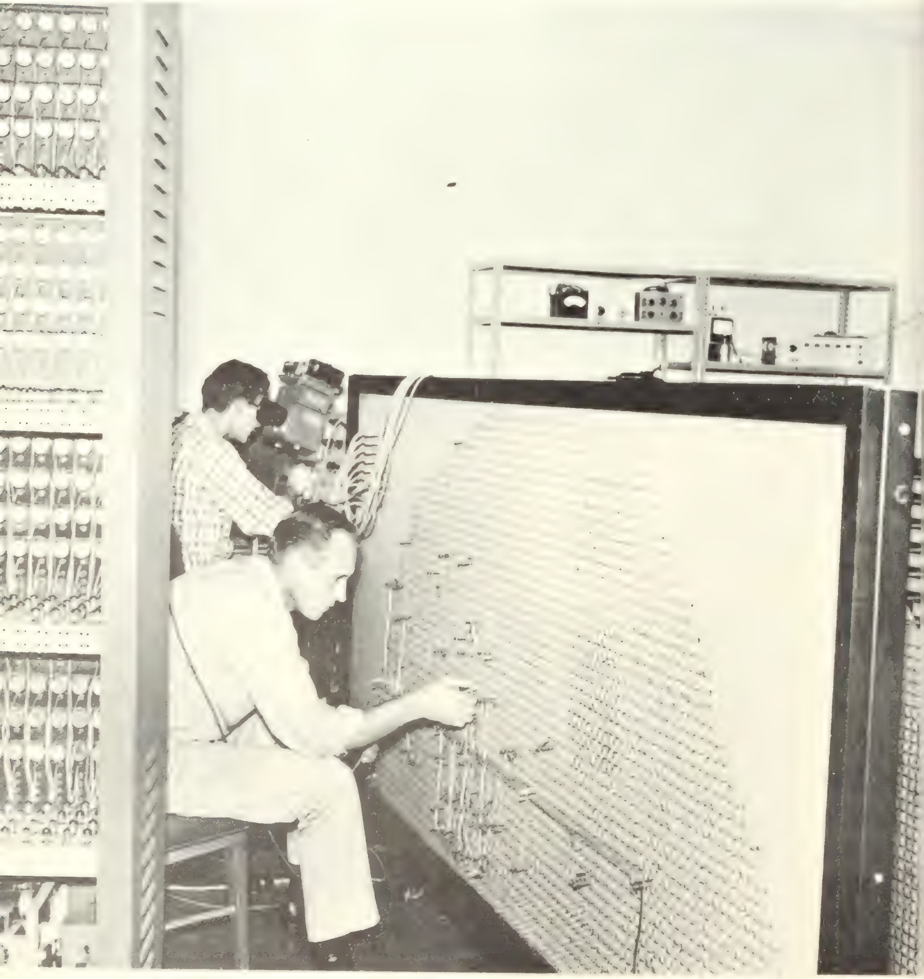
It is imperative that new concepts and principles be developed to enhance the accuracy of predicting ground-water trends. Studies of the movement of water above the water table and the movement of water in clays are designed for this purpose.

A computer facility has been constructed for analyzing ground-water problems. It converts the geological and engineering information into quantitative data. The computer techniques developed can handle detailed analysis of complex ground-water systems. In many cases it now is possible to predict the results of ground-water removal over large areas well into the future.

In association with a research project, a sensitive differential permeameter (an apparatus for measuring the capacity of materials to transmit water in different directions) has been designed and constructed. The design of the permeameter is analogous to a wheatstone bridge in which microvalves are used as three arms of the bridge, and the porous media sample the fourth. A highly sensitive pressure transducer meter is used as the null-measuring device.

The measurement of water used by riparian vegetation and direct evaporation has been a difficult problem throughout the history of the science of hydrology. A project is in progress to

This electric analog model and equipment is used for analyzing specific water problems. The tall rack of electronic equipment simulates the characteristics of evaporation and plant use.



refine techniques for measuring evaporation and nonbeneficial use of water by plants. Instruments for measuring evapotranspiration losses have been modified for airborne use and for data processing through a radar station equipped with an analog computer.

Investigations of effects of vegetation on ground-water supplies in semiarid regions of Arizona continued. The water requirements of saltcedar, willow, greasewood, and other brush were studied along with the long-range Gila River phreatophyte project.

For many years, water scientists have had an imperfect understanding of how iron and manganese occur in water and the natural controls associated with these metals. Although it was early known that iron and manganese were objectionable in water supplies, the practical problems of treatment and prediction were less understood.

In the past year, Survey research chemists made substantial progress in fathoming the chemistry of manganese in water.

Since the introduction of synthetic detergents for cleaning, much trouble has been experienced with their undesirable characteristics at both water-supply and waste treatment plants. By their nature, the synthetic detergents are not readily removed at treatment plants. Studies of ground-water pollution by the Survey show that foams from the more common types of detergents are unstable at concentrations of less than 2 parts per million. If other organic substances, such as soaps or proteins are in solution, however, these low concentrations of detergents may foam. Quantities of detergents in streams in urbanized areas are regularly reported in analyses of water samples taken by the Survey.

When water is withdrawn from a stream, used for cooling in an industrial process, and returned to the same stream, its most obvious change in quality is an increase in temperature. This temperature increase can be serious during summer low-flow conditions, for as temperature increases, dissolved oxygen decreases and the oxidation of wastes declines coincidentally with lower flows for dilution of wastes. Fortunately, Survey studies have shown that thermal loading is a local problem because the added heat is rapidly diffused and dissipated. Progress has been made in determining thermal die-away patterns and ecological effects in heated streams of industrial areas in Tennessee, Pennsylvania, and Maryland.

A study began in the Patuxent River estuary to assess the effects of urbanization in general and also the effects of hot water releases from an electric generating plant on the physical, chemical, and geological character of a tidal river. Special equipment for continuous monitoring and periodic analysis of dissolved oxygen was

A Geological Survey scientist checks wind velocity in a thermal die-away study.

designed in cooperation with Johns Hopkins Chesapeake Bay Institute. Initial trials of this equipment were promising.

The radiohydrology program, supported in large part by the Atomic Energy Commission, included about 30 continuing projects such as: hydrology of radioactive waste disposal to the environment at eight nuclear sites, with supporting laboratory and model studies; effects of nuclear explosions on water-bearing characteristics of earth materials; natural radioactivity in ground and surface waters of the United States; use of radioisotopes as tracers of water movement in specific hydrologic environments; principles governing the transport of radionuclides in the hydrologic environment.

## International Cooperation Aids Hydrology

During the year, through the auspices of the Agency for International Development, 25 Geological Survey hydrologists worked overseas with 14 host governments, sharing knowledge of recent advances in hydrologic research and methods and techniques of water-resources investigations. In addition, training in the United States was given 25 specialists from 15 countries.

Hydrogeologic investigations and training in Chile, in progress for the past 7 years, were completed. An investigation and ground-water development program begun in 1959 under Survey guidance continued in the Western Desert of Egypt. In the Punjab region of Pakistan an investigation seeks to evaluate historic irrigation practices that have led to the present salinity problems, and to develop guidelines for reclamation practices, salinity control, and optimum use of available water.

## New Water Resources Reports Issued

In response to increased public interest in water and water problems, the Survey intensified its program of reports. "Water in Alabama," the first of several reports on the total water resources of individual States, was published in 1963. Similar reports were in preparation.

A new series of folders on water investigations in each State is being issued. The folders enable a reader to determine quickly what information on water in that State is already published, or is being collected. The folders include pertinent facts about water

A Geological Survey engineer in Egypt conducts field tests on Gormashin well water for carbon dioxide at Kharga Oasis—part of the Department's program to assist other nations in natural resource development.

resources and a list of publications available. In addition, a map of the State shows where additional information is being obtained through Survey investigations.

Of special interest was the publication of a comprehensive report, "The Role of Ground Water in the National Water Situation." This report follows a similar but less comprehensive summary written a decade ago and published in 1951 as Geological Survey Circular 114. The report summarizes the occurrence and development of water in 10 ground-water regions covering the 48 conterminous States. Detailed description of the situation in each of the 50 States and Puerto Rico and the Virgin Islands forms the major part of the report.

During fiscal 1963, the Survey prepared 76 water-supply papers, 9 circulars, 18 professional papers, 54 maps, and 3 bulletins concerning water. In addition, 80 reports on water were prepared for public reference, and 472 reports on water were prepared for publication as cooperative State reports or as articles or abstracts for scientific journals.

## GEOLOGIC DIVISION PROJECTS VARIED

Geologic Division projects in fiscal 1963 were characterized by an impressive range of subject matter, some of which a decade or so ago might have appeared to be in the realm of science fiction. Localities under study, either directly or by interpretive techniques, were on every continent of the world and also deep in the earth's crust and outward to the moon.

The broad goals of the Survey's Geologic Division are to determine the materials the land is made of (regional geology) and how they were formed (experimental geology), to appraise their mineral resource potential (economic geology), and to determine some of the factors that affect use of the land for construction and similar activities (engineering geology).

The areas studied ranged from the Arctic to the Antarctic; from the United States to Indonesia (and other foreign nations in both hemispheres); from the depths of the Atlantic Continental Shelf to Karakoram in the Himalaya; and from charting of the earth's crust to an interpretation of the lunar crust.

Most of these studies were financed by the Survey's direct appropriation from Congress; some were undertaken in behalf of, and supported by, other Federal agencies, including the Department of Defense, the Atomic Energy Commission, the National Aeronautics and Space Administration, the National Science

A Geological Survey geologist prepares to examine horizontal sandstone beds and diabase sills in an Antarctic mountain group discovered during 1962–63 about 300 miles rom the South Pole. Gasoline-powered motor toboggan pulls sleds carrying equipnent and supplies for the month-long field trips from the base camp.

Foundation, the Agency for International Development, and the Interior Department's Bureau of Mines, Office of Minerals Exploration, and Bureau of Reclamation. Other studies were made in cooperation with 16 States, the Commonwealth of Puerto Rico, the county of Los Angeles, and the municipality of Metropolitan Seattle.

## Physical Inventory of the United States Continues

A fundamental study of the kinds of rocks at the earth's surface and how they are related to each other at the surface and at depth (areal geology) is basic to scientific prospecting of the earth for its mineral and fuel resources, to industrial and civil planning, and to efficient use of the land for countless other purposes. This knowledge gained about a particular area or region is best summarized by a geologic map, which uses line or color patterns and various symbols to show the kinds of rocks that are exposed at the surface (or are reasoned to lie beneath the soil), and the probable shapes and structures of the various rock masses at depth. Geologic mapping, therefore, is a "physical inventory" that must be taken to provide the basis for intelligent use of the land for any purpose.

The areas being mapped geologically by the Survey during 1963 comprised many different types of geologic terranes ranging over the entire United States and extending from Alaska to Antarctica. In most areas the mapping was supplemented by laboratory study and paleontological, geophysical, and geochemical investigations to provide a geologic map and an understanding of the geologic history—how each rock formation originated and what changes it has undergone to bring it to its present form and position.

In addition to this program of large-scale geologic mapping, studies and compilations of maps of large regions or of national scope continued in 1963 as a small but important function of the Geologic Division. Such maps depend on data from mapping and topical studies by Geological Survey personnel, on published data, and on unpublished data generously provided by State geological surveys, private companies, and universities. Collaborative maps now in preparation include a geologic map of North America, scale 1: 5,000,000; a basement map of North America from latitude 20°–60° N., scale 1 : 5,000,000; a Bouguer gravity anomaly map of the United States, scale 1 : 2,500,000; and a tectonic map of North America.

The long-term program to produce paleotectonic maps—maps that summarize what is known of the rocks of a given period of geologic time over the whole United States—continued. The maps and report on the Permian System have been compiled and were being prepared for publication; compilation was well advanced on the Pennsylvanian System. The Mississippian System was started.

A new program in marine geology and hydrology, being coordinated with other Government agencies and private institutions, will yield significantly additional knowledge of offshore land areas and will provide a better understanding of sedimentary rocks and other features that were once formed in marine areas and subsequently raised above sea level. Emphasis is being placed on a 5-

year study of the east coast Continental Shelf, from New England to Florida, in cooperation with the Woods Hole Oceanographic Institution.

## Minerals and Mineral Fuels Resources Studied

Research in economic geology has immediate application in filling current and anticipated needs for mineral raw materials, by delineating areas favorable for the occurrence of additional deposits in known mining districts, by delineating areas beyond the limits of known districts that are broadly favorable for the occurrence of concealed deposits, by defining sources of previously little-used elements for which new uses have created or are likely to create important demands, and by developing new exploration methods and tools.

Highlights of the Geologic Division's 1963 accomplishments in economic geology include—

. . . Several new maps were published in the Mineral Resources series showing the locations of important mineral-bearing areas in the United States. The new maps, printed at a scale of 1: 3,168,000, are MR 35, beryllium; MR 36, niobium and tantalum; and MR 37, high alumina clay. This series of maps will be useful in the search for additional ore deposits and districts as well as serving as a basis for testing regional concepts of ore deposition.

. . . An elaborate study in eastern Nevada indicated the possibility of important new base-metal ore deposits in the Egan Range, near the Ely mining district. An account of the discovery was published and was followed by exploration by the mining industry.

. . . Mapping on Big Chief Creek, in the Yellow Pine quadrangle, Idaho, showed bulges in a major silicified zone that are considered favorable sites for prospecting for gold, antimony, and tungsten.

. . . In Ontonagon County, Mich., aeromagnetic surveys disclosed an abnormal magnetic field that may be caused by iron formation lying under a thin cover of sandstone.

. . . Reconnaissance studies in parts of northern peninsular Florida suggest that phosphatic sands and clays of Miocene and younger age are sufficiently widespread and abundant to be of interest as potential resources of phosphate and uranium.

. . . A report on the mineral and water resources of Montana, prepared in cooperation with the Montana Bureau of Mines and Geology and published as a committee print of the Senate Committee on Interior and Insular Affairs, describes the known and potential sources of minerals and mineral fuels, and discusses them in terms of the economic and geologic factors that may affect their further development and use. Similar reports are now being prepared for several other States.

. . . New beryllium deposits were discovered in the Lost River area, western Seward Peninsula, Alaska. Systematic stream sediment sampling indicated that other areas in the Seward Peninsula have an unusually high content of beryllium in the stream sediments and that more discoveries of ore deposits in nearby rocks may be anticipated.

. . . The tin locality at Irish Creek, Va., showing some geologic similarities to the Lost River tin-beryllium area, has been sampled to ascertain its potential for beryllium. Results show that there is enough beryllium to warrant more thorough exploration.

. . . Geologic mapping in St. Lawrence County, N.Y., led to the discovery and delineation of several tremolite-rich deposits somewhat similar to those now being mined for industrial talc.

. . . Survey geologists reported a hitherto undescribed alunite deposit at Aspen Mountain, Sweetwater County, Wyo. Analyses indicate that parts of the deposits have 60 to 90 percent alunite and may be potentially valuable for preparing commercial sulfates or alumina refractory materials.

. . . Field investigations in the Western Raton coalfield, 8 miles southeast of Vermejo Park, N. Mex., led to the discovery of a potentially commercial coal zone about 15 feet thick.

. . . Geological mapping in southwestern Virginia revealed that a major anticline beneath the Powell River Valley may extend about 15 miles northeast of the limit previously recognized. This knowledge affords an excellent opportunity to test the oil and gas potential of the pre-Devonian rocks in the area by shallow drilling. Oil was recently discovered in a test well drilled on the southwestern part of the anticline, which was mapped and recognized as favorable by the Survey in 1954.

Geological Survey conducts studies in several major urban areas on geologic aspects of various construction problems. Here a geologist inspects an earth embankment in a suburban development near Washington, D.C., for earth slide which may endanger homes if unchecked.

## Geology Applied to Construction Activities

The field of engineering geology presents ever-increasing opportunities for beneficial application of geologic knowledge and concepts to problems of urban development and land utilization. The Survey's geologic studies of urban areas in many parts of the country have proved useful in providing information on special problems of excavation, foundation stability, and drainage, and on local availability of construction materials. Some of the 1963 accomplishments in this field were:

> . . . A new geologic study of the Rapid City area, South Dakota, showed that shales underlying much of the older parts of the city are highly expansive and are therefore a major factor in causing failures in engineering structures of many

kinds. A geologic map of part of the city and test data on some of the geologic units were released for public inspection.

. . . Studies of the glacial history of western Massachusetts revealed isolated bodies of gravel and sand, only about a third of which have been or are being exploited for construction materials.

. . . A study of 195 landslides in a suburban area east of San Francisco Bay yielded information on factors that contribute to landsliding and suggested means by which the effects of some of these factors might be reduced.

. . . In Colorado, preliminary results were announced of a geologic study to develop new techniques by which highway builders would predict in considerable detail the problems that might arise in driving tunnels.

## Experimental Geology Provides New Facts

While geologic maps reveal what kinds of rocks occur in a particular place at the earth's surface, a full understanding of how the rocks of the crust were formed or deformed and how they got where they are requires knowledge of natural processes many of which take place deep within the crust. Detailed geochemical and geophysical experiments—both in the laboratory and in the field—help provide the basis for understanding how these processes operate and how their results may be used advantageously.

Experimental investigations in geochemistry and mineralogy in 1963 continued to provide new data on the processes of formation of a variety of rocks and mineral deposits and to improve analytical methods useful in the laboratory and the field.

. . . The team of earth scientists at the Survey's Hawaiian Volcano Observatory, situated on the rim of Kilauea Crater Hawaii, continued detailed observation and interpretation of volcanic processes by using a variety of geochemical and geophysical techniques. In one phase, a ceramic probe was inserted 4 feet into liquid lava in the crater, through a hole drilled 45 feet through the hardened lava crust, to permit measurement of the rate of cooling of the lava by recording its temperature at short periodic intervals. The highest temperature recorded at that depth is 1095° C (2003° F).

. . . A spectacular development in the study of ore-forming processes was provided by a deep well drilled by a private company for geothermal power near Salton Sea, in the Imperial Valley of California. A Survey geologist reported

Measuring the temperature of liquid lava in the cooling lava lake of Kilauea Crater Hawaii, is part of Geological Survey's continuing studies at Hawaiian Volcano Obervatory. Steam jetting from a hole drilled into the crater is from water being hosed nto the hole to cool the hot lower portion.

that the well encountered a hot, very saline brine, extraordinarily high in heavy metals and rare elements, which appears to be an unusual sample of an active ore solution.

. . . Isotope and nuclear investigations find many applications in geology by providing quantitative measurements that frequently indicate new methods of attacking old problems.

As one example of the scores of such studies carried on during fiscal 1963, carbon 14 analyses were used to determine the age of rocks from an eruption of Mount Rainer, Wash., as about 550–600 years.

. . . A portable instrument to detect beryllium, designed and constructed in the Geological Survey's Denver laboratories, was being adapted for use in drill holes.

. . . In the field of rock analysis, a new X-ray fluorescence method, when used with a nine-channel X-ray quantometer, permits simultaneous analysis for nine major rock constituents. The results are comparable in accuracy with those obtained by rapid chemical procedures, but may be obtained much more rapidly with substantially smaller samples. As many as 30 rock samples a day can be analyzed by the new method.

Research in geophysics during 1963 also covered a wide range. Among the more significant findings were:

. . . Completion of detailed paleomagnetic studies of rocks from the island of Hawaii showed that the direction of the magnetic field in the central Pacific area has changed very little since 1750, in contrast to other areas.

. . . Aerial infrared reconnaissance of parts of the island of Hawaii revealed several previously unknown fresh water springs, both cold and hot, flowing into the ocean in areas close to the shoreline. Because of the water-supply problems on the island of Hawaii, these springs may be of significant economic value.

. . . In the Geological Survey's crustal studies program, major objectives of which are to evaluate seismic methods of detecting nuclear tests and to determine the thickness, composition, structure, and physical properties of the earth's crust and upper mantle, the network of recordings of seismic waves from underground nuclear and chemical explosions was expanded to cover most of the western United States. From a total of about 2,000 recordings it has been possible to deduce variations in the thickness of the crust and in the seismic velocities of the upper mantle rocks in this broad region.

## Geology Applied to Human Welfare

Directly related to human welfare were several investigations of geology applied to problems in the field of public health. Environmental studies have received increased attention in recent years. The rocks on which we live, the soils in which our foods grow, and the water we drink are highly significant factors in the human environment. Accordingly, the Geological Survey is participating in many investigations of how these factors affect health.

> . . . One such investigation is a comparison of the water, soils, and rocks of Washington County, Md., and San Juan County, N. Mex. This work is designed to aid medical investigators in their study of the relation of incidence of cancer and heart disease in the respective areas to natural environmental differences.
>
> . . . A study of the intensity of natural radiation and distribution of radioactive minerals in the rocks, soils, and waters of the United States is of special interest to environmental health investigators because of the known relation of artificial radiation to the incidence of cancer.
>
> . . . A map was published showing the maximum fluoride content of ground waters for about 90 percent of the conterminous United States.

Underground testing of nuclear devices and the generation of power by nuclear reactors release radioactive products. To safeguard the public, the distribution, movement, and concentration of these products must be determined and the potential danger evaluated. Since 1956 the Geological Survey has provided geologic and hydrologic information and evaluations of such facts on behalf of the Atomic Energy Commission for its testing facility at the Nevada Test Site and at sites for Plowshare and other experiments elsewhere in the United States.

## Military Geology Aids Defense

The Geologic Division's Branch of Military Geology conducts geologic studies of selected areas throughout the world in response to specific requests from the Department of Defense for information applicable to military engineering, such as rock types, soils, vegetation, water resources, construction materials, and suitability of the ground for constructing roads, underground installations, and airfields. Other portions of the continuing program provide geological consulting services to the Army in Europe and the Pacific area. Among the unclassified studies underway in 1963 were investigations of surficial geology of numerous areas in Alaska and Greenland.

## Geology Helps Other Countries

Scientific and technical assistance in geology to foreign governments has been carried out for the past two decades by the Geological Survey, with the primary aim of providing advisory services and helping train earth science specialists gain better understanding of their natural resources. This assistance, under the auspices of the Department of State (Agency for International Development), included in fiscal 1963 the training, advisory, and service functions of 47 Geologic Division scientists working in cooperation with their host country counterparts in 10 nations, and the training in this country of 47 earth scientists and technicians from 21 countries. Some of the accomplishments of these programs in fiscal 1963 were:

> . . . A new report by the Geological Survey (published in Spanish) on the geology of La Paz Valley, Bolivia, supplies the construction engineer with new basic data about ground conditions which will greatly aid future city planning and development.
>
> . . . Discoveries were made of a large field of shallow, easily minable coal 100 miles northeast of Karachi, Pakistan, and of deposits of high-grade phosphate rock in southeastern Turkey.

## Geology of the Moon and Other Extraterrestrial Bodies Studied

The major immediate objective of the Survey's studies in astrogeology, on behalf of the National Aeronautics and Space Administration, is to determine and map the composition and structure of the rocks that make up the moon's crust, in preparation for manned and unmanned landings. Three main approaches are being followed: geologic mapping of the moon by means of information obtained from visual, photographic, and photometric studies with telescopes; investigations of natural and artificial impact craters on the earth's surface, and study of extraterrestrial materials, such as meteorites and tektites, that may originate from or occur on the moon.

Geologic maps of the Kepler and Letronne areas of the moon at a scale of 1: 1,000,000 were published in fiscal 1963, each covering about 100,000 square miles.

Stereoscopic examination of two slightly different photographs permits Survey astrogeologists to interpret the geology of a part of the lunar surface. Such studies of photographs and telescopic observations help unravel the complex geologic history of the lunar surface.

New data are being obtained on the landforms on the moon's surface, the depth of layers of material that cover much of the surface, the origin of the moon's craters, the physical and chemical properties of tektites (glassy materials thought to have originated from impacts on the moon's surface), and the design of instruments to be used in lunar exploration.

## Many Geologic Publications Issued

Results of the Geologic Division's investigations were published during fiscal 1963 in 122 professional papers and bulletins, 1 water supply paper, 2 circulars, 206 geologic maps, and some 280 technical papers in scientific journals. An additional 77 reports were made available in files open for public reference.

"Geophysical Abstracts," previously published from time to time as a Geological Survey Bulletin, became a monthly periodical in January 1963. Important findings and a synopsis of current research were published in Professional Paper 450–A, "Geological Survey Research 1962," and 139 short papers summarizing results of individual Geologic Division studies in progress were published in chapters C, D, and E of that report. To present new findings as rapidly as possible, the first chapter of short papers for "Geological Survey Research 1963" was published separately as Professional Paper 475–B. It includes 46 additional short papers on current research in the Division's studies.

## TOPOGRAPHIC DIVISION PREPARES MANY MAPS

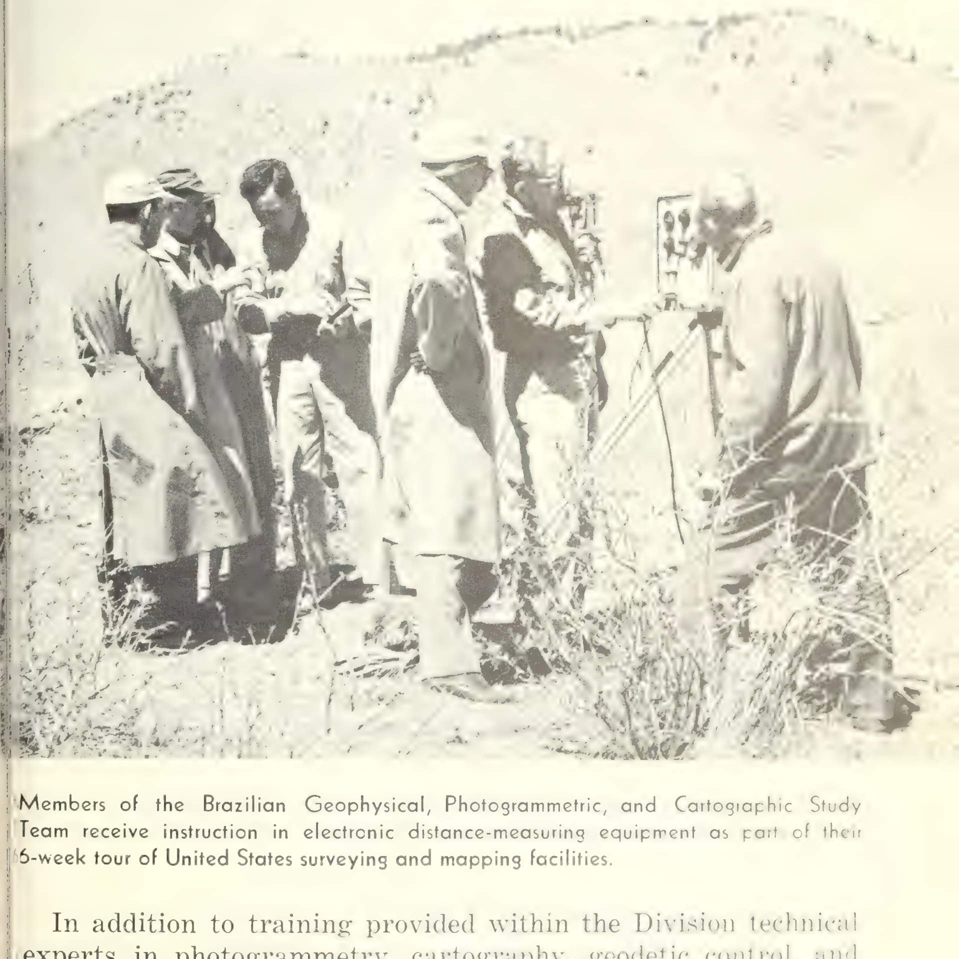
The primary objective of the Topographic Division is the preparation and maintenance of the national map series covering the United States and its outlying areas. This series has become an essential tool for the most effective development of projects vital to national progress and economy, and an important factor in the public's growing appreciation of its outdoor heritage.

Other functions of the Division include preparation of related maps and publications of national interest; periodic revision of all published materials; and constant research and development to improve map products, operating methods, and plotting equipment. Information regarding map products and mapping activities of Federal agencies is available to the Government and the public through the Map Information Office maintained by the Topographic Division in Washington, D.C.

### International Cooperation Stressed

Many nations of the world have benefited from technical assistance provided by the Geological Survey in cooperation with the Agency for International Development (AID) and other technical assistance programs.

During fiscal 1963, the Topographic Division provided technical inservice training in topographic mapping procedures to accredited representatives of Argentina, Brazil, Cyprus, Egypt, Guatemala, Indonesia, Liberia, Nigeria, Philippines, Spain, Sudan, and West Germany.



Members of the Brazilian Geophysical, Photogrammetric, and Cartographic Study Team receive instruction in electronic distance-measuring equipment as part of their 6-week tour of United States surveying and mapping facilities.

In addition to training provided within the Division technical experts in photogrammetry, cartography, geodetic control, and electronic distance-measuring equipment were supplied to AID for extended assignments. They are assisting the mineral exploration program of Pakistan, a water supply development program in Egypt, and gaging operations on the Amazon River in Brazil.

A topographic map of the United Kingdom of Libya, scale 1:2,000,000, with bilingual legends in English and Arabic, was published and a geologic edition was underway. Reception of this map by the Libyan people and interested oil companies was excellent. On October 16, 1962, President Kennedy presented a copy to Crown Prince Hasan Al-Rida Al-Sanusi.

## Surveying and Map Preparation Active

The total land area of the United States and its outlying areas comprises 3,558,387 square miles. At the close of fiscal 1963, 66 percent of this area was covered by topographic surveys at scales of 1 : 24,000 and 1 : 62,500 (1 : 63,360 in Alaska). These surveys have been published as standard quadrangles for 57 percent of the total area. Advance copies, prior to map publication, are available upon request for the remaining 9 percent.

During the year, 543 maps of previously unmapped areas equivalent to 1.6 percent of the total area were published. Another 0.7 percent, formerly covered by 15-minute maps (1 : 62,500-scale) at obsolete standards, was replaced by 439 new maps at 1 : 24,000-scale standards.

Each year adds to the growing backlog of 10-year-old 7½-minute maps which probably require revision, and mapping added to this list during fiscal 1963 totaled 56,237 square miles. In 1963, the backlog was reduced by 10,400 square miles, leaving approximately 318,400 square miles of 7½-minute mapping requiring revision at year's end.

The latest electronic distance measuring equipment is used to obtain mapping control in rugged mountain terrain.

The Topographic Division completed the first full year of its long-range mapping plan. The aim is to complete coverage of the United States with standard topographic quadrangles in either the 7½- or 15-minute series by fiscal 1976, and 7½-minute coverage for all of the conterminous United States and the islands by 1981. During this period, a program of revision and maintenance of published maps will be conducted and small-scale maps or other special maps will be produced as they are needed in the national interest.

As part of the national topographic mapping program, a survey of American Samoa was essentially completed during the fiscal year for publication at 1 : 24,000 scale. Topographic mapping of the Alaska Peninsula at 1 : 63,360 scale (1 inch to the mile) started and will cover some 11,700 square miles extending from Unimak Island to Ugashik, including the offshore islands.

Urban area maps were published for the metropolitan areas of Boston, Mass., and Wichita, Kans.

Except for a few remaining quadrangles, now in reproduction, the 3-year cooperative mapping program to provide complete 7½-minute coverage for Ohio was completed. A cooperative program was increased with the State of Virginia for complete coverage with modern large-scale quadrangle maps and is scheduled for completion in 1969. Reflecting the increasing interest in uniform map coverage, New York State appropriated funds to expand their cooperative mapping program with first priority to provide 7½-minute coverage for the entire State.

The Geological Survey reached an agreement with the Army Map Service to complete the revision of 22 maps in the 1 : 250,000-scale series, and to finish work on 19 additional maps which the Army had in progress. In addition, the Survey's regular program of maintenance of this map series during the year included the limited revision of 106 maps.

Reflecting the growing interest of the public in wildlife and recreational areas, the Topographic Division has authorized new maps covering national parks, monuments, and wildlife areas in six States. These include the Badlands National Monument, S. Dak.; Assateague, Md.; Bad River Indian Recreation Area, Wis.; and the Okefenokee Swamp National Wildlife Refuge. This mapping was specifically requested by the National Park Service, the Bureau of Outdoor Recreation, and the Bureau of Sports Fisheries and Wildlife.

Following is a detailed summary of map publication during fiscal 1963:

*Number of maps published during fiscal year 1963 and areas surveyed to produce these maps*[1]

| | Area (sq. miles) | Number of maps | |
|---|---|---|---|
| | | 7½-minute | 15-minute |
| LARGE-SCALE MAPS | | | |
| Standard quadrangle maps: | | | |
| New: | | | |
| Mapped at 1:24,000 scale standards | 36, 997 | 379 | 69 |
| Mapped at 1:62,500 scale[2] | 19, 042 | | 95 |
| Replacement of 1:62,500 maps by mapping at 1:24,000 standards | 25, 166 | 428 | 11 |
| Revised | 16, 244 | 184 | 30 |
| Reprinted without revision | | 413 | 467 |
| Special editions: | | | |
| Series conversion | 1, 643 | | 8 |
| Scale conversion | 10, 020 | 73 | 30 |
| Total large-scale maps | 109, 112 | 1, 477 | 710 |

| | Number of maps |
|---|---|
| SMALL-SCALE AND SPECIAL MAPS | |
| New maps: | |
| Metropolitan area | 2 |
| Shaded relief | 1 |
| Antarctica | 6 |
| Map revision: | |
| Metropolitan area | 1 |
| 1:250,000 scale | 85 |
| State base | 5 |
| Shaded relief | 7 |
| 1:1,000,000 scale | 9 |
| Topographic indexes | 71 |
| Reprinted | 82 |
| Total small-scale and special maps | 269 |
| Total maps | 2, 456 |

[1] The area of Antarctica maps is not included.
[2] Includes 1:63,360 mapping, Alaska only.

## Antarctic Mapping Continues

The Geological Survey again participated in mapping operations in Antarctica conducted as part of the U.S. Antarctic Research Program of the National Science Foundation. During the austral summer of 1962–63, the Division assigned seven topographic engineers to the ice continent to establish geodetic control for mapping.

A four-man party, using the most modern electronic distance-measuring equipment and transported by helicopters, obtained map control for 90,000 square miles of hitherto inaccessible terrain in northern Victoria Land and the mountainous area between the Beardmore Glacier and the Horlick Mountains.

Control surveys for topographic mapping in rugged western mountains employ helicopters and two-way shortwave radio.

Other members of the Survey team, in conjunction with their control activities, assisted as navigators for geologic exploration parties in the Ellsworth and Pensacola Mountains.

Stellar observations for geodetic positions were made by Survey engineers at the U.S. South Pole Station and at McMurdo Base as well as at critical points along the traverse routes.

The U.S. Navy Air Development Squadron Six (VX-6) obtained about 44,000 square miles of aerial photography for use in the Survey's mapping program. To assist in flight planning and to advise on the quality of photography required for mapping, a Survey photographic technician again was assigned to the squadron's photographic laboratory in Christchurch, New Zealand.

The Topographic Division maintains the U.S. Antarctic Map and Aerial Photographic Library to provide reference and consultant services to technical and scientific visitors.

A Geological Survey team obtained map control for 90,000 square miles of hithert inaccessible terrain in northern Victoria Land, Antarctica. Their campsite is show above.

During fiscal 1963, topographic maps in shaded relief edition at 1: 250,000 scale were published of Antarctic areas in the Thie Mountains, the Executive Range, and for parts of the Horlic Mountains. Maps at the same scale are in progress for the Quee Alexandra Range, the Britannica Range, the McMurdo Sound area and other areas in the Horlick Mountains.

A contract was completed during the year for a unique two-laye plastic relief model of the Antarctic Continent at a scale o 1:10,000,000, or 1 inch equals 160 miles, with the vertical scal exaggerated 25 times. The base section shows the submarin floor, the sub-ice topography, and the ice-free mountain areas o the continent. The semitransparent upper and removable sec tion shows the sea-level surface and the vast continental ice mass A limited number of these experimental models has been made fo scientific study.

Through modern topographic maps, aerial photography, an this three-dimensional model, the Antarctic frontier emerges fro mystery and obscurity for study and evaluation.

## Research Facilities Concentrated

Major research efforts in the Topographic Division in fisca 1963 were devoted to improving the accuracy and economy o control surveys and to developing better techniques for mapping in dense evergreen woods, for revising quadrangle maps, and for preparing a series of planimetric maps.

The Division moved most of its research facilities to McLean, Va., near Washington, D.C., early in the year. The concentration of research activity is expected to improve coordination of development effort, especially on complex projects requiring the cooperation of many different specialists.

## Second-Order Control Surveys

Six test projects were undertaken in cooperation with the Coast and Geodetic Survey to determine whether the control surveys executed by the Geological Survey for topographic mapping could be strengthened to meet second-order standards economically through the use of modern equipment and to ascertain how much extra cost would be involved.

As a result of these tests, the two agencies agreed on a policy regarding future control surveys for mapping by the Geological Survey. This agreement provides: that, as much as is feasible, horizontal control will be completed by the Coast and Geodetic Survey prior to the beginning of mapping operations by the Geological Survey, and that any horizontal control which cannot be completed in time by the Coast and Geodetic Survey will be performed by the Geological Survey to second-order standards, with final adjustments into the national network being made in all cases by the Coast and Geodetic Survey; and that the basic vertical control required for mapping will continue to be executed by the Geological Survey to third-order standards.

## Airborne Control-Survey System Tested

The Topographic Division is experimenting with an airborne control-survey system for extending geodetic control by a combined system of ground-to-air measurements. In this system, known as the ABC system (to signify "airborne control"), a helicopter serves both as an aerial platform above ground points on which geodetic position is desired and as a transportation medium for ground-support crews. When hovering over a desired ground position, the craft serves as a target for angle measurements from one or more ground stations and as the "remote" station for the electronic distance-measuring equipment.

The ABC system was used experimentally on a mapping project in Arizona during January and February 1963. Tests were conducted for comparison of the ABC system and the conventional ground-survey methods, with respect to time, costs, and accuracy.

Survey engineers in a helicopter supported geodetic traverse in Antarctica using electronic equipment to measure the distance to a companion unit on a distant mountain peak.

Comparison of the results obtained by the two methods indicates a difference of about 0.6 foot in the vertical data. The horizontal control data still was under analysis.

### Map Revision Techniques Explored

Map revision, wherein existing topographic maps are updated, is becoming an increasingly important part of the topographic mapping program. Studies have been started to explore map obsolescence factors, evaluate revision needs and requirements, and investigate the most efficient techniques and instrumentation for accomplishing the revision task. The cartographic presentation of revision data by printing in a distinctive color is also being investigated.

### Visual Fatigue Studies Made

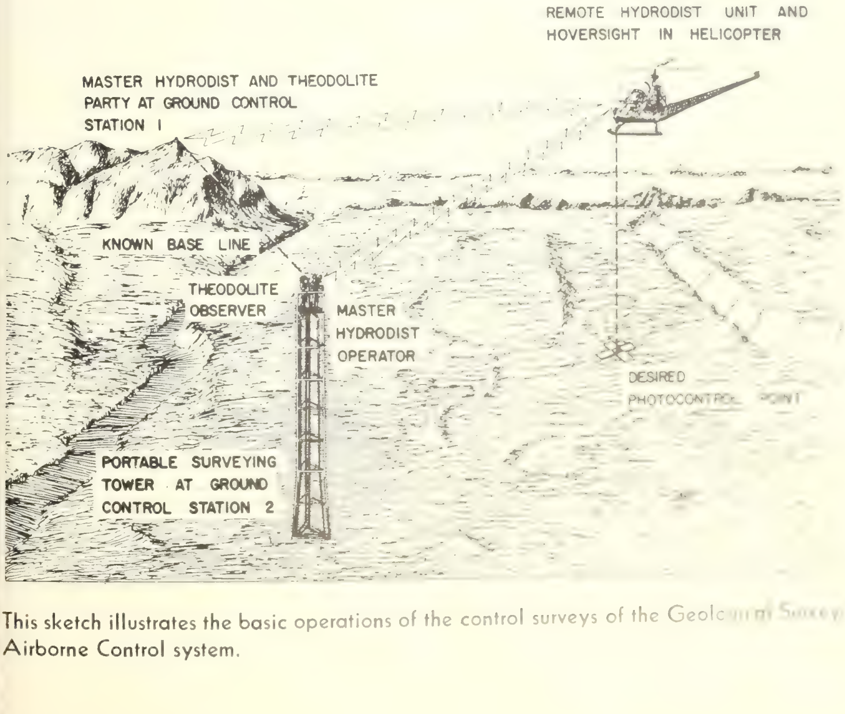
Based on the favorable findings of a pilot research project, an expanded study of visual fatigue of 60 stereoplotter employees in various age groups is being conducted in the Topographic Division's Rocky Mountain Area office. The participants have received refractive corrections for normal visual defects and have been assigned to stereoplotter operations under controlled optimum conditions of ambient light.

The resulting physiological and psychological effects are being studied. In addition to possible improvements in stereoplotting efficiency in all age groups, these tests may reveal whether extended assignment of experienced personnel in the older age group can be expected.

## Analytical Aerotriangulation Uses Computer

Development neared completion on a fully analytical system of aerotriangulation and the associated computational program. The computer program has the capability of solving blocks of up to 22 photographs in any configuration. It embodies provisions for correcting for the systematic lens-distortion and film-distortion errors and for a least-squares adjustment of random errors in the measured photo coordinates.

Tests are planned to verify the soundness of the mathematical principles involved and the fidelity of the computer program and to determine the accuracy characteristics and optimum control configurations. Substantial savings in field survey costs are possible when the system becomes operational.


REMOTE HYDRODIST UNIT AND HOVERSIGHT IN HELICOPTER
MASTER HYDRODIST AND THEODOLITE PARTY AT GROUND CONTROL STATION 1
KNOWN BASE LINE
THEODOLITE OBSERVER
MASTER HYDRODIST OPERATOR
DESIRED PHOTOCONTROL POINT
PORTABLE SURVEYING TOWER AT GROUND CONTROL STATION 2

This sketch illustrates the basic operations of the control surveys of the Geological Survey Airborne Control system.

## Super-Wide-Angle Photogrammetric System Examined

In investigating the possibilities for economy offered by the super-wide-angle photogrammetric system in mapping, the Topographic Division successfully completed flight testing of its RC–9 aerial camera. This camera has an angular coverage of 120 degrees, compared to 90 degrees for present mapping cameras, with a corresponding reduction in control requirements. It was used over Los Angeles, Calif., where the wealth of planimetric detail and abundant ground control will permit evaluation of the resolution and flatness of stereomodels projected from super-wide-angle photography. Flight designs have been formulated for super-wide-angle photography at a variety of flight heights; these will be used to evaluate the super-wide-angle photogrammetric system in map compilation. The operational tests are planned for 1964.

## Dense Evergreen Wooded Terrain Poses Problem

The magnitude of the problems involved in achieving accurate maps in densely wooded areas was confirmed by recently completed initial studies. Research is aimed at determining the consistency of compilation under various combinations of photogrammetric parameters and establishing, if possible, the most effective techniques for compiling in dense evergreens. Plans for a more extensive research program are being formulated. New techniques for obtaining a dense pattern of detailed ground information to assist the photogrammetrist in compiling from both panchromatic and infrared photographic coverage will be tried.

## Experimental Map Published

An experimental map publication, a four-color orthophotomosaic print of the Roanoke SW, Virginia, 7½-minute quadrangle, was completed in 1963. The consensus of those who reviewed this orthophotomap was that it represented a significant improvement in presenting orthophotography in map form. Press plates prepared from negatives processed by photo-image enhancement techniques permitted reproduction without halftone screening. The general appearance of the experimental publication was quite pleasing. The product complies with the National Map Accuracy Standards for horizontal position.

Detailed drawings and specifications for a new orthophotoscope have been completed. Investigations are continuing in the feasibility of digitizing the X, Y, and Z data derived during the scanning process. These data may be used subsequently both to control

This new-model printer makes glass plate photographic transparencies with improved contrast for use in stereoscopic plotting instruments.

the exposure of orthophotography and to determine elevations for contouring or profiling.

## Quality Control Stressed

In cooperation with other Government agencies, the Geological Survey has developed and applied new and more rigid specifications for diapositive plates supplied by commercial firms. Based on these specifications, a program of quality control was started to detect small differences in emulsion characteristics. With plates of uniform quality assured, the diapositive technician can select the material and procedure that will extract the greatest amount of information from the aerial mapping film. This objective is becoming more important with the increased emphasis on orthophotography, edge enhancement, and other procedures where the image structure itself plays a vital role in the final map display.

## Map Information Office Serves Public

Facilities for supplying information on maps, aerial photography, and geodetic control surveys to government agencies and the public are maintained at the Map Information Office in Washington and at the Division's four Area Offices in Arlington, Va.; Rolla, Mo.; Denver, Colo., and Menlo Park, Calif.

The 13th edition of the index map, "Status of Aerial Photography," was published during the year, and material was assembled for the 9th edition of the index map, "Status of Aerial Mosaics." These indexes show all areas known to have been photographed and those for which aerial mosaics or photomaps are known to have been compiled by Federal, State, or commercial agencies. The aerial photography index shows complete coverage for the 50 States, Puerto Rico, the Virgin Islands, and American Samoa.

A supplement to the aerial photography index for the calendar year 1962 was published for administrative use. This index map shows areas for which photography was contracted for or delivered during the year.

Forty-seven sheets in the 1 : 250,000-scale series of geodetic control diagrams were published in cooperation with the Coast and Geodetic Survey. These diagrams, of which 88 have been published, show the location of horizontal and vertical control surveys accomplished by the two agencies and provide information essential to planning topographic mapping projects, to engineers establishing electronic facilities, to land surveyors making connections to the Federal net, and to those engaged in scientific investigations.

The Office was distributing center for the Survey's training films on topographic mapping, photointerpretation, geology, water resources, and safety programs. More than 17,000 bookings were scheduled during the year for use by other Federal agencies, educational institutions, and specialized groups.

Public interest continued in maps of Civil War battlefield areas. Circular 462, a bibliography of government maps and charts covering areas in which the major battles of the Civil War took place, was revised and reprinted.

The floating drilling barge "Ocean Driller," commissioned in New Orleans in April 1963, can drill in water depths up to 600 feet and is capable of drilling to depths of 20,000 feet.

# CONSERVATION DIVISION

The Conservation Division has broad responsibilities in the application of conservation practices for the protection and development of the mineral and water resources of Federal and Indian lands. The Division also supervises the administration of the Connally Act of February 22, 1935.

## Oil and Gas Operations Active

Supervision of oil and gas activities includes operations for the discovery, development, and production of crude oil, natural gas and products extracted from natural gas, on Federal, Indian, and certain military and naval petroleum reserve lands.

Unitization activities of oil and gas operations involving public and acquired land were reflected in the approval of 83 new unit plans during the year and the termination of 60 that had been previously approved, leaving 478 approved plans covering 7,816,019 acres outstanding. About 64 percent of the petroleum, 29 percent of the natural gas, and 55 percent of the gasoline and liquefied petroleum gases obtained from public and acquired lands during the year were produced under approved unit agreements.

*Table showing supervised oil and gas activities, fiscal 1963*

*PRODUCTION, VALUE AND ROYALTY*

| Lands | Oil (barrels) | Gas, (1,000 cubic feet) | Gas, liquids (gallons) | Value | Royalty |
|---|---|---|---|---|---|
| Public | 173, 040, 000 | 503, 798, 000 | 440, 187, 000 | $544, 164, 000 | $67, 788, 000 |
| Acquired | 6, 093, 000 | 308, 831, 000 | 1, 432, 000 | 22, 261, 000 | 2, 807, 000 |
| Indian | 41, 949, 000 | 88, 092, 000 | 118, 202, 000 | 125, 655, 000 | 17, 225, 000 |
| OCS | 93, 929, 000 | 532, 563, 000 | | 388, 182, 000 | 68, 959, 000 |
| Military and miscellaneous | 2, 814, 000 | 82, 981, 000 | 68, 067, 000 | 23, 213, 000 | 4, 872, 000 |
| Naval Petroleum Reserve No. 2 | 3, 851, 000 | 6, 450, 000 | 12, 702, 000 | 14, 500, 000 | 1, 964, 000 |
| Total | 321, 676, 000 | 1, 522, 715, 000 | 640, 590, 000 | 1, 117, 975, 000 | 163, 615, 000 |

*LEASES AND WELLS UNDER SUPERVISION*

| Lands | Number of leases | Acres | States affected | Wells spudded | Wells completed | Completions productive | Wells as of June 30, 1963 | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Productive | Total |
| Public | 115, 266 | 76, 274, 296 | 29 | 1, 721 | 1, 827 | 1, 130 | 21, 386 | 37, 337 |
| Acquired | 6, 836 | 5, 004, 595 | 35 | 94 | 88 | 38 | 450 | 1, 210 |
| Indian | 10, 675 | 3, 964, 679 | 15 | 464 | 448 | 285 | 6, 993 | 12, 092 |
| OCS | 838 | 3, 649, 567 | 2 | 535 | 712 | 515 | 3, 319 | 4, 630 |
| Military and miscellaneous | 22 | 19, 818 | 5 | 18 | 28 | 25 | 324 | 367 |
| Naval Petroleum Reserve No. 2 | 17 | 9, 226 | 1 | 9 | 8 | 7 | 536 | 791 |
| Total | 133, 654 | 88, 927, 181 | | 2, 841 | 3, 111 | 2, 000 | 33, 008 | 56, 427 |

On the Outer Continental Shelf no unit plans were approved and none was terminated during the year. The total now stands at 15, embracing 348,253 acres.

On Indian lands, 11 new units were approved and 3 were terminated; the total number of plans in effect at year's end was 92, involving 204,972 acres.

The Department approved 197 drilling units, or communitization agreements, during the year and 2 were terminated, leaving 1,533 outstanding. Two development contracts were approved and five were terminated. A total of 18 such contracts were outstanding, involving 7,392,571 acres.

## MINING

Supervisory control is exercised by the Survey over mining activities concerned with prospecting, development, and production of minerals under permits and leases on public, Indian and acquired lands.

At year's end there were under supervision 2,158 properties involved in leases, permits, and licenses in 28 States, of which 1,220 were on public land, 238 on acquired land, and 700 on Indian land. Production from such lands during the fiscal year is estimated at 26,450,715 tons, valued at $162,358,000. Royalties were $7,879,600.

In order of magnitude of production, potash ranked first with 13,531,800 tons, valued at $86,595,200, followed by coal, 5,536,400 tons, valued at $27,122,300; sand and gravel, 3,006,300 tons, valued at $2,926,200; and phosphate, 1,882,800 tons, valued at $5,120,000. Other production in substantial quantity included uranium ore, 781,400 tons, valued at $13,353,100, and sodium compounds 1,028,700 tons, valued at $24,925,200.

### Many Mineral Classifications Made

During fiscal 1963, a total of 45,700 cases were processed by the Survey, including 6,355 cases involving the outright disposal of Federal lands either with no reservation of minerals or with the reservation of one or more specified minerals. There were 36,822 cases involving the exercise under Federal leasing laws of the Government's right to lease a mineral substance to private enterprise.

Initial or revised definitions were made of 100 producing oil and gas fields on, or affecting, Federal leaseholds; 476 reports were made on the mineral potentialities of federally owned lands for various agencies of the Federal Government; and 485 reports were

Supervisory function of the Geological Survey include enforcement of mine safety regulations. Here two Survey engineers inspect potash mines on leased Federal lands in New Mexico.

made to industry or individuals in connection with activities on Federal lands involving unit plans, participating areas, productive limits of oil and gas fields, and associated matters. Geologists from field offices of the Branch made investigations and prepared reports and maps as needed to assist engineers in planning the development of petroleum and mineral deposits and in the administration of Federal leases.

Approximately 1,700 square miles were mapped geologically to aid in the classification of the public lands. Geologic investigations were completed and classification data submitted covering a total of 8,389,737 acres. Final action was taken on approximately 1 million acres of this land and the resultant classifications, as to value for leasable minerals, were published in the Federal Register.

Fifty-three maps were completed; eight were in the process of being published and five have already been published or released in open file. These are: Geologic map of Cooper Cove and Dutton Creek oil fields and vicinity, Albany and Carbon Counties, Wyo.; Geology of the Hot Sulphur Springs 4 NE quadrangle, Colorado; Garnes Mountain SE quadrangle, Utah; Geology of the Paradise quadrangle, Utah; and Geologic Notes on the Delaware Basin.

New maps, or revisions of old maps, showing areas considered to be valuable prospectively for oil and gas, coal, oil shale, phosphate, sodium, potash, and bitumens were made for several States during fiscal 1963.

## Water Resources Classified

Investigations were continued to determine the potential of streams on the public lands for waterpower and the conservation storage of water. The program is largely confined to the western United States and Alaska, where most of the remaining public lands are located. A map of 130 miles of the Clark Fork River, Mont., was published. Reports on reservoir site investigations in northern Nevada and on glacier observations, Glacier National Park, 1962, were released in open file. Geological Survey Circular No. 400, "History of Land Classification Relating to Waterpower and Storage Sites," was revised and reprinted.

Estimates of the waterpower potential of the United States were revised and will be published by the Geological Survey along with estimates of the Nation's reserves of other energy producing resources.

The review of public land withdrawals for waterpower and water storage purposes was continued. One report, "Review of Waterpower Withdrawals, Kern River, California," was completed in which 60,000 acres were reviewed and 38,000 recommended for restoration from withdrawal.

Acting on a request by the Army Corps of Engineers, the Geological Survey submitted to the Secretary for approval, a power site classification covering the public lands in the reservoir area of the proposed Rampart Dam, on the Yukon River, Alaska. This is noteworthy because it affects nearly 9 million acres of land lying mostly in the Yukon Flats.

One hundred and sixty-four reports were submitted to the Bureau of Land Management on the waterpower value of lands affected by applications for rights-of-way easements and 6,355 reports were made on applications for land acquisition.

Thirty-nine waterpower reports were made on applications to the Federal Power Commission for restoration of lands in power site withdrawals.

### Connally Act Administered

The Connally Act supports conservation activities of oil-producing States by prohibiting the interstate shipment of oil produced in violation of certain State oil and gas conservation laws. It is administered by the Geological Survey through the Federal Petroleum Board with headquarters at Kilgore, Tex.

While the Connally Act is applicable wherever State laws limit the rate of production and prescribe conditions for producing and handling petroleum and its component parts, its chief application has been in Texas, Louisiana, and New Mexico. Violations of the Connally Act by producers outside designated areas have also been prosecuted and penalties imposed, notably in Mississippi, Oklahoma, Arkansas, and Kansas.

Unless exempted by the Board in writing and by notice, producers within designated areas are required to maintain and file correct and complete monthly and semiannual reports. A separate report must be made by the operator for each pool of field.

At the beginning of the year, 24 cases of alleged violation of the act were pending on the docket of the Board and 305 new cases were formalized during the year. Four cases, resulting in fines of $54,600, were settled. At year's end, 318 cases were on the Board's docket.

## PUBLICATIONS ISSUED

Results of research and investigations by the Geological Survey are made available to the public through a variety of reports and maps. Of the formal reports published by the Survey, books are printed and sold by the Government Printing Office and maps are printed and sold by the Survey.

During the year, 247 technical book reports were published. Maps printed totaled 3,155, comprising nearly 9,500,000 copies, as follows:

| Kinds of maps | Number printed |
|---|---|
| Topographic map: | |
| Standard | 2, 380 |
| Other | 107 |
| Geologic maps: | |
| Geologic quadrangles and miscellaneous investigations | 74 |
| Mineral resources | 34 |
| Geophysical investigations | 108 |
| Water resources maps: Hydrologic atlases and other maps | 69 |
| Maps for inclusion in book reports | 290 |
| Maps for other agencies | 93 |
| Total | 3, 155 |

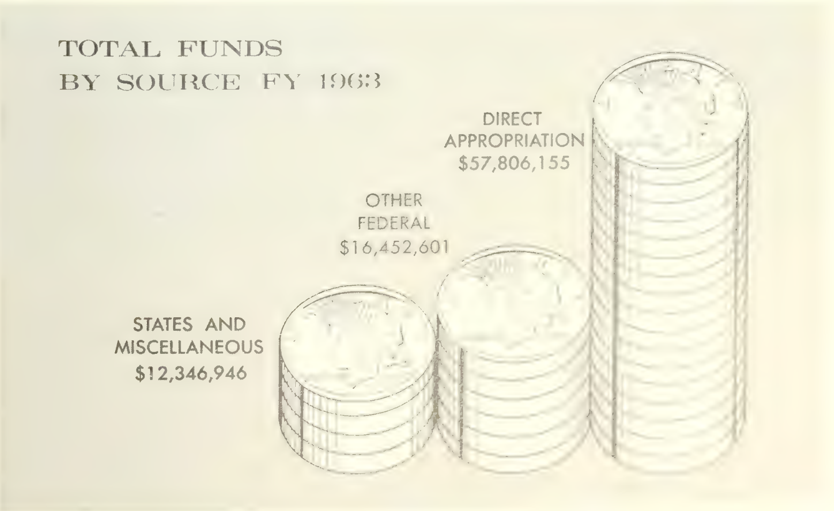
Geological Survey maps were distributed by mail from bulk stocks at Silver Spring, Md., Denver, Colo., and Fairbanks, Alaska. Over-the-counter map sales are made at these and 13 other Survey offices. In addition, 580 commercial agents throughout the United States sell these maps to the public.

In addition to approximately 46,275,000 maps and books on hand at the beginning of the year, 8,606,800 copies of new and reprinted maps and 480,100 copies of book reports were received. Distribution of 5,306,650 copies of maps was a 13-percent increase over fiscal 1962. Also during fiscal 1963, the Geological Survey distributed, free and for official use, 360,700 book reports and pamphlets, 138,200 copies of the monthly announcement of new publications, and 245,000 topographic map descriptive folders and symbol sheets.

The total distribution was implemented by 294,400 individual orders. Seventy-four percent of the maps distributed were sold, and $739,871.20 was deposited to miscellaneous receipts in the U.S. Treasury.

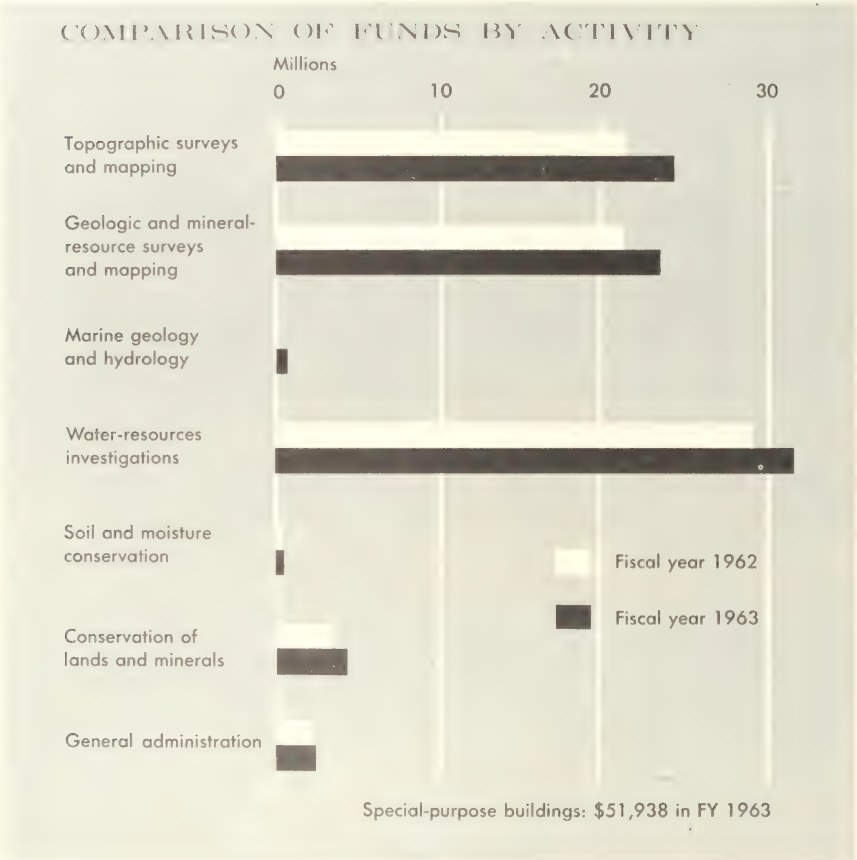
The following table shows a comparison between Geological Survey map and book distribution during fiscal 1962 and 1963:

| | 1962 | 1963 | Percent change |
|---|---|---|---|
| Washington | 2, 864, 350 | 3, 513, 100 | +23 |
| Denver | 1, 675, 750 | 1, 740, 250 | +4 |
| Fairbanks | 43, 050 | 45, 950 | +7 |
| Other offices | 415, 350 | 368, 050 | −11 |
| Total | 4, 998, 500 | 5, 667, 350 | +13 |



# FUNDS

During fiscal 1963, operating funds of the Geological Survey were $86,605,702. Charts show sources of incurred obligations and compare expenditures by various Survey activities.



# Bureau of Mines

## Marling J. Ankeny, Director

Research remained the major concern of the Bureau of Mines during fiscal year 1963: Research so varied and comprehensive that it embraced virtually all the minerals and fuels required to sustain and advance modern civilization as well as the safety and health of those who mine and process the Nation's mineral wealth . . . research so far reaching that it touches the lives of all Americans and affects much of the free world. Such was the Bureau's challenge and opportunity.

Studies by the Bureau during the year ranged from the complex technological problems posed by marginal resources of metals, nonmetals, coal, oil, and gas to the life-or-death necessities of astronauts, who enter outer space in metal ships powered by exotic mineral fuels.

Of immediate interest were new projects to develop patterns for turning strip-mined land into recreational areas and for intensifying the attack on mineral-related pollution of America's rivers and streams. Of importance to the future was the Bureau's entry into marine research—recovery of mineral resources from the sea.

Not all the Bureau's objectives were fully realized, nor can they ever be in a conservation field where the problems far outnumber the apparent solutions. Nevertheless, significant advances were made in research and also in promoting health and safety among mineral industry workers, in studies of economic and technological developments in minerals at home and abroad, and in other important phases of the varied programs of the Bureau. Many are described in the following pages.

# BITUMINOUS COAL AND LIGNITE

Continuing success in hydraulic-mining experiments, advances in techniques for transporting coarse coal, and significant progress in the search for new markets for abundant lignite resources were among the highlights of Bureau research on bituminous coal and lignite during the 1963 fiscal year.

Hydraulic mining with high-pressure water jets—particularly adaptable to extracting coal from inclined or pitching coalbeds—has been developed by the Bureau to a point where future research can be devoted primarily to determining the best combination of volume of water, pressure of water, and shape of water nozzle required to mine coal at a particular site. The Bureau's small (40 gallons per minute) high-pressure (4,500 pounds per square inch) equipment was moved from an operating mine at Roslyn, Wash., to an even more steeply pitching coalbed in an active mine near Carbondale, Colo. Preliminary tests at the close of the fiscal year showed the equipment to be superior in productivity compared with the hand-mining methods previously employed at Carbondale. The Bureau's larger equipment was moved from Lebanon, Pa., to the Roslyn mine and will be used there during fiscal 1964.

In the related field of hydraulic transportation, the Bureau drew nearer its goal of establishing the feasibility of carrying broken coal from working faces to a surface preparation plant—and perhaps to the ultimate consumer. Among other developments, it completed the design of a mile-long experimental pipeline 6 inches in diameter that will convey lumps up to 2 inches in size.

## New Horizons Seen for Lignite

Significant progress was made in searching for new markets for lignite and in solving problems associated with its present use as a solid fuel. Producers of lignite for use as a powerplant fuel have adopted as a commercial practice the Bureau-developed system for freezeproofing winter shipments: 10 percent of dried lignite fines are mixed with untreated lignite before it is loaded into railroad cars.

The Bureau's pilot high-pressure slagging lignite gasifier operated at increased pressures up to 400 pounds per square inch with the anticipated improved efficiency in producing synthesis gas. This gasifier, the Bureau hopes, may eventually make it possible to convert lignite to high-Btu pipeline gas, chemicals, and synthetic fuels.

Promising experiments were conducted to produce a combination fertilizer and soil conditioner—equivalent to naturally oxi-

Identifying the complex ingredients of coal tars leads to more efficient ways to utilize the Nation's coal resources. Here a Bureau of Mines scientist looks for clues as to the nature of tar ingredients in a graph that records the reactions of a tar sample to infrared radiation.

dized lignite or leonardite—by oxidizing lignite artificially to increase its humic acid.

## Explosives Research Has Space-Age Impact

The traditional role of the Bureau of Mines as the Federal authority on industrial explosives and explosions has given it several special tasks in connection with space flight and missiles. At the

Valuable products, including chemicals and cokelike fuels, have been made from high moisture coal in the Bureau of Mines carbonizing reactor to the left. Costs are low, and the process holds promise of opening new markets for coals that would otherwise be more limited in their usefulness.

request of the U.S. Army's Ballistics Research Laboratory, the Bureau's Explosives Research Center at Pittsburgh, Pa., conducted experiments in which thin metal plates were perforated by "hyper-ballistic" projectiles traveling at speeds of 2 to 3 miles per second. Information on correlation between spalling from the rear surface of the target and the size and speed of the projectile is expected to improve future methods of shielding space vehicles from meteors. The Bureau's experience in designing and using low-pressure tanks—in connection with explosion studies—was called upon by the Air Force in seeking a solution to the problem of extinguishing fires in space vehicles. The Bureau designed special low-pressure chambers that simulate a space capsule operating at altitudes of 100,000 feet. The chambers have been used for experiments in which fires were put out when vented into a low-pressure atmosphere.

## ANTHRACITE

A three-pronged anthracite research and conservation program was carried on by the Bureau of Mines during fiscal 1963. It was aimed at improving mining and preparation methods, stimulating demand, and protecting reserves not now being mined. Supplementing these efforts were fundamental studies of anthracite's physical, chemical, electrical, and surface properties. Bureau personnel continued to work closely with representatives of the Commonwealth of Pennsylvania in carrying on the jointly financed, Federal-State mine-water-control program and in controlling or extinguishing fires in inactive anthracite mines.

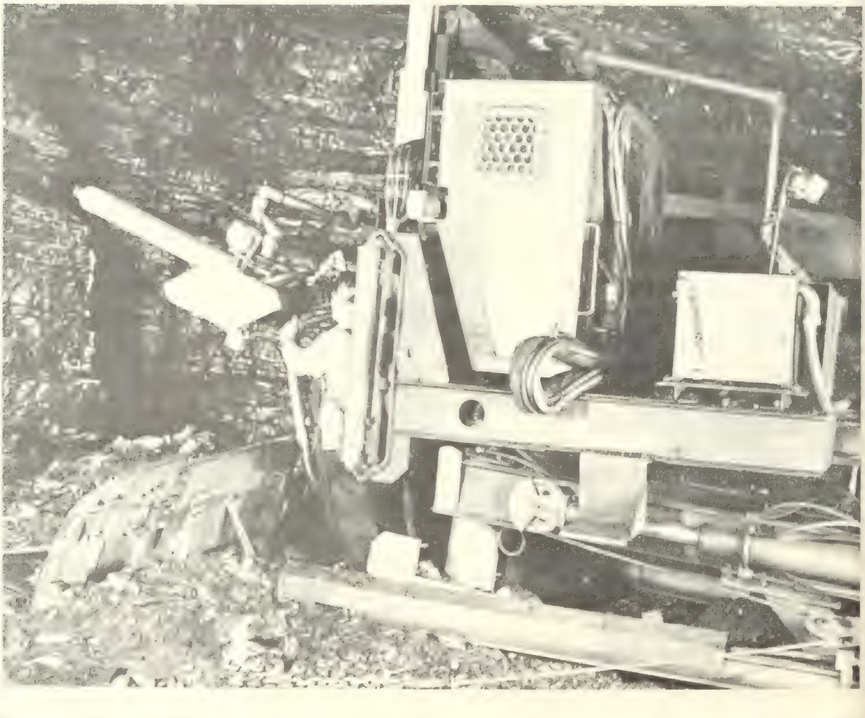
### Hydraulic-Mining Experiments Continue

Underground tests of the Bureau's hydraulic-mining system—adapted to use slightly higher pressures in hard anthracite than are needed in bituminous coal seams—continued through the year in an operating mine at Sugar Notch, Pa., resulting in significant changes and improvements. The mobile "jumbo" that supports and controls the 5,000-pound-per-square-inch stream of water used to cut the coal was modified to improve safety, increase productivity, and reduce power consumption. The conveyor system also was improved so removal of mined coal could keep pace with the fast cutting action of the hydraulic monitor. Plans were completed at year's end for continuing tests with various water pressures and with varying volumes of water and nozzle openings.

## Methods Sought for Making Anthracite "Fines"

Ultra-fine-grinding techniques were studied during the year as a means of obtaining a product that can hold or extend certain markets that have long been served by anthracite "fines" dredged from the Susquehanna River. Standard procedures for sampling, screening, determining density, and analyzing particle size were being developed at year's end, and the suitability of heavy-medium equipment for cleaning mixed fine sizes was being investigated.

In continuing studies aimed at developing metallurgical uses for hard coal, calcined anthracite briquets, prepared at the Bureau's Anthracite Research Center, Schuylkill Haven, Pa., were used with various burdens and at varying air rates in the Bureau's experimental blast furnace at Bruceton, Pa. Extensive tests in which these briquets were used successfully to melt iron in cupolas were reported during the year.



Designed by the Bureau of Mines, this experimental hydraulic equipment eliminates the need for dangerous blasting and also promises increased efficiency in mining of anthracite and bituminous coal. The equipment cuts hard coal from anthracite seams with a jet of water with a force of 5,000 pounds per square inch.

### Mine-Water Control Program Extended

Congress broadened the scope of the Federal-State mine-water control program in October 1962 by authorizing the sealing or filling of abandoned mines in the interest of public health and safety. Several new projects were being considered at the close of the year. Ultimate expansion of this program is expected to be aided by information gained during an intensive study of all underground mine workings in the anthracite region of Pennsylvania. This last, now more than 70 percent complete, is being performed at the request of the Corps of Engineers to determine the effect of these workings on the stability of levees, impounding basins, and other surface flood-control structures.

## AIR-POLLUTION CONTROL

As national concern over air-pollution problems mounted during the year, Bureau studies were speeded in its traditional area of authority—those aspects of pollution related to production and use of minerals and mineral fuels. Cooperation continued with the Public Health Service of the U.S. Department of Health, Education, and Welfare. During the year the Bureau laid particular stress on identifying the causes of air pollution and on various methods of controlling, reducing, or eliminating such pollution at its source—before contaminating gases enter the atmosphere.

Research continued or expanded at various coal and petroleum research centers and laboratories and—in cooperation with State agencies and with private industry—in field studies. Equipment and techniques previously developed to study ways in which smog is created from engine exhaust gases were in use at the end of the year. Saturation sprinkling was tested for extinguishing a burning coal-refuse pile.

Preparations were completed for new studies of the effects of catalytic afterburners in changing the composition of exhaust gases from automobile engines and making them less objectionable. The role of a major antiknock chemical (tetraethyl lead) and other gasoline additives in fouling catalytic afterburners was studied. Another study was performed in cooperation with the Atomic Energy Commission on the use of depleted uranium in catalytic exhaust afterburners. A uranium oxide catalyst was developed and is being tested.

Flue gases from two large coal-fired electric utility boilers were analyzed, and potential ways of removing sulfur dioxide from such gases were advanced. Initial tests of one such means—dropping a granular absorbent into the ascending gases within the flue—proved it capable of eliminating 70 to 98 percent of sulfur dioxide.

## FOREIGN ACTIVITIES

Bureau reporting on international mineral developments that vitally affect the mineral economy of the United States was substantially expanded during the past year. This increased activity was in line with a study of research needs in the natural resource field, made by the National Academy of Sciences at the request of the President. A 40-percent increase in appropriations noted by the Congress enabled the Bureau to intensify its work in this area.

### Thousands of Inquiries Answered

Bureau analyses and economic evaluations of statistical material regarding foreign minerals were used extensively by Government agencies, industry, and the public. Over 6,000 inquiries from American industry and Government sources were answered.

A Bureau of Mines engineer measures the combustion rate of a smoldering coal refuse pile during studies on how to control such sources of air pollution. Vapors in the background show clearly in this photograph but most atmospheric pollution is invisible.

Holding his child up for a look, a Nepalese mine owner inspects the first ingot of copper from a new furnace designed by a Bureau of Mines metallurgist (center) as part of the Government's technical assistance program for friendly foreign countries. The Bureau scientist is on loan to Nepal under the auspices of the Agency for International Development (AID).

## Contributions Made to International Science and Trade

Bureau participation in international conferences was notable during the year. In Geneva, its specialists contributed five well-received technical papers to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less-Developed Areas. The author of one of these papers was the official U.S. delegate at the natural resources phase of the conference.

Bureau specialists often are chosen for assignment to foreign countries as mineral attachés in the Department of State. The

Bureau nominates technologists, usually from its own staff, who then become Foreign Service officers for periods of 4 to 6 years During fiscal 1963, Bureau personnel were performing in this capacity in Australia, Bolivia, Brazil, England, Ghana, India, Peru the Republic of South Africa, and Turkey. An expansion of this program was authorized during the year, and candidates soon wil be selected for posts in Belgium, Libya, and Mexico.

### Foreign Technical Assistance Gains

Under the sponsorship of the Agency for International Development, the Bureau participated in technical phases of the foreign aid program of the United States; 17 Bureau technologists gave technical assistance in all phases of the mineral industry in eight countries—Afghanistan, Bolivia, Indonesia, South Korea Mexico, Nepal, Pakistan, and Taiwan. The support of Bureau laboratories and staff members at home contributed to these and other AID projects abroad.

One of the most important of foreign-aid activities is the training of foreign nationals in the United States. During the year the Bureau helped train 78 foreign mineral technicians, and at year's end 37 were still training under Bureau auspices. In all, 19 countries were represented.

To date, eight Bureau publications on mine safety have been translated into Spanish by the Regional Technical Aids Center of AID in Mexico. These publications have been widely distributed in Latin America, where the especially popular "First Aid Manual" has already sold about 20,000 copies.

### Reports on Foreign Developments

Results of the Bureau's examination of anthracite deposits in Antarctica, sponsored by the National Science Foundation, were published. A definitive report on the importance of minerals in Japan's industrial economy was published along with a similar one on the petroleum industry of Iran.

## MINERALS DEVELOPMENT

New and better ways for increasing efficiency and economy in the Nation's mineral industries continued to flow from Bureau of Mines research in fiscal 1963, a year that saw advances in many different branches of mineral investigation. The year also marked the Bureau's entrance into a new scientific field—marine minerals research. A ton of manganese-bearing nodules, dredged from the ocean floor near Baja California, was sent to a Bureau laboratory for analysis as a possible new source of metal to fill the Nation's growing needs. From this modest beginning, the Bureau plans ultimately to expand its technological studies into such promising areas as marine prospecting, underwater mining, and problems of sea-water pollution. Thus, mineral resources as yet untapped can be made accessible to help meet requirements of the future.

### Explosive Rockbolt Developed

Mining of deposits in soft rock, traditionally a difficult and hazardous enterprise, was made both easier and safer by the Bureau's development of an explosively anchored rock bolt. With a holding power in soft ground superior to that of conventional bolts, the new rock bolt will reduce the danger of rock falls, offering better protection to men and equipment and conceivably permitting development of deposits that cannot now be mined economically. Interest has already been expressed in commercial markets for the device.

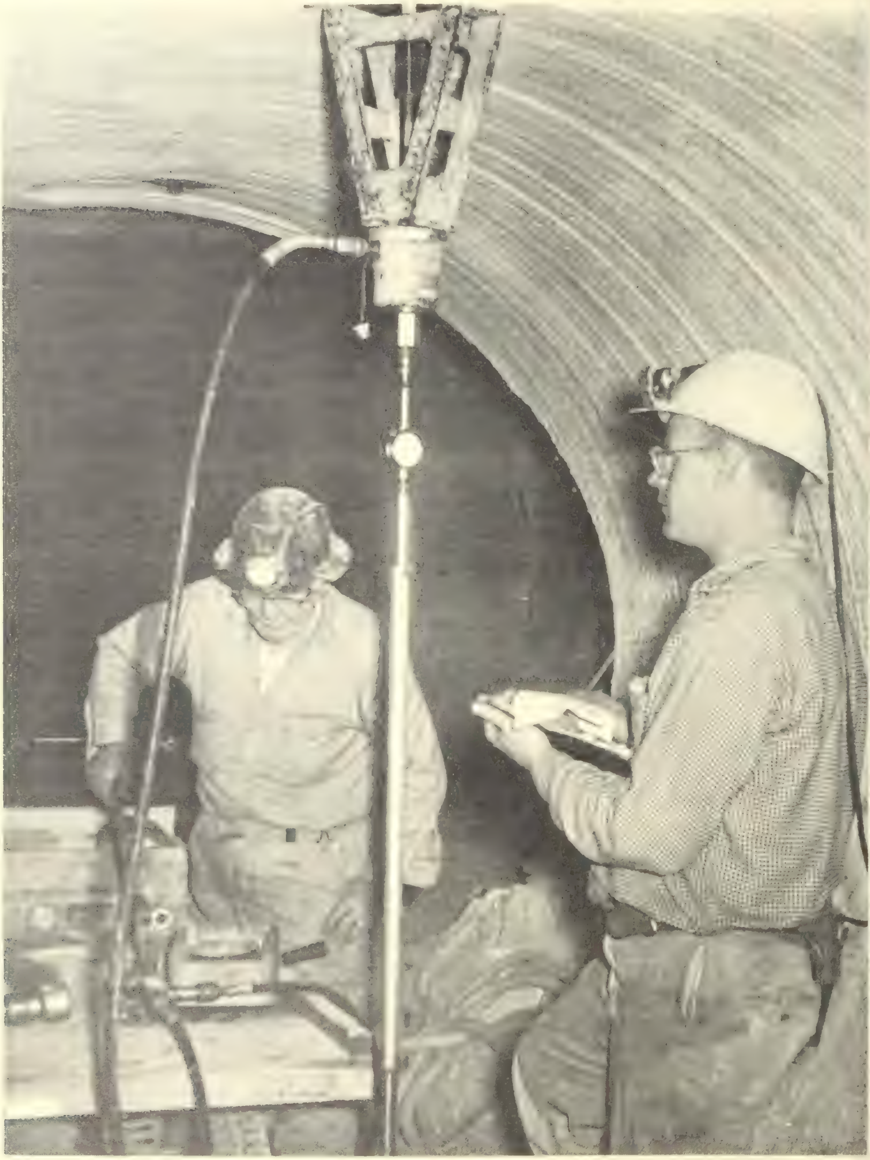
Ingeniously constructed laboratory models were used in studies of rock bolting mine roofs composed of "beds," or layers of rock. As a result, Bureau engineers developed a theory relating the friction between such rock strata to a so-called suspension effect—a tendency of less flexible rock layers to lend support to the more flexible ones when they are bolted together.

### Blasting Phenomena Studied

Research also continued on the problem of vibration damage to buildings from blasting, and criteria were set up for predicting probable damage by measuring the velocity of individual earth particles caught in vibration waves. To increase efficiency in the use of explosives, the Bureau developed a method for determining the point at which rock under sudden stress will shatter. Results of one study on the importance of matching certain physical qualities of explosives to the rock in which they are to be used have already been applied by industry to achieve lower costs and increased productivity in quarrying.

### Industry Helped by Drilling Studies

Knowledge obtained in Bureau research on the measurement and significance of noise from pneumatic rock drills was disseminated to industry during the year. Meanwhile, detailed reports on the design of mufflers for abating this noise were being readied for publication.



Anchored explosively in the ceiling of this mine chamber, a new Bureau of Mines rock bolt resists thousands of pounds of pull exerted hydraulically by the engineer with the pump. Such tests have demonstrated the superior holding power of the new bolt in loose rock formations.

Basic research in drilling progressed at the Minneapolis Mining Research Center in Minnesota, where scientists used plastic "model rocks" to study the distribution of stresses during drilling. By learning more about the fundamental forces involved, the Bureau hopes to find new ways for increasing drilling efficiency. A high-speed computer system is also used by the Bureau to speed complex calculations in basic research on rock mechanics and other aspects of mining engineering.

Other mining studies during the year led to development of a more precise method for classifying waste material that can be transported hydraulically. Such material often is used to fill mined-out areas underground. The new system, which relates the density of the substance to the rate at which water percolates through it, will allow mine operators to use the various grades of this material more effectively.

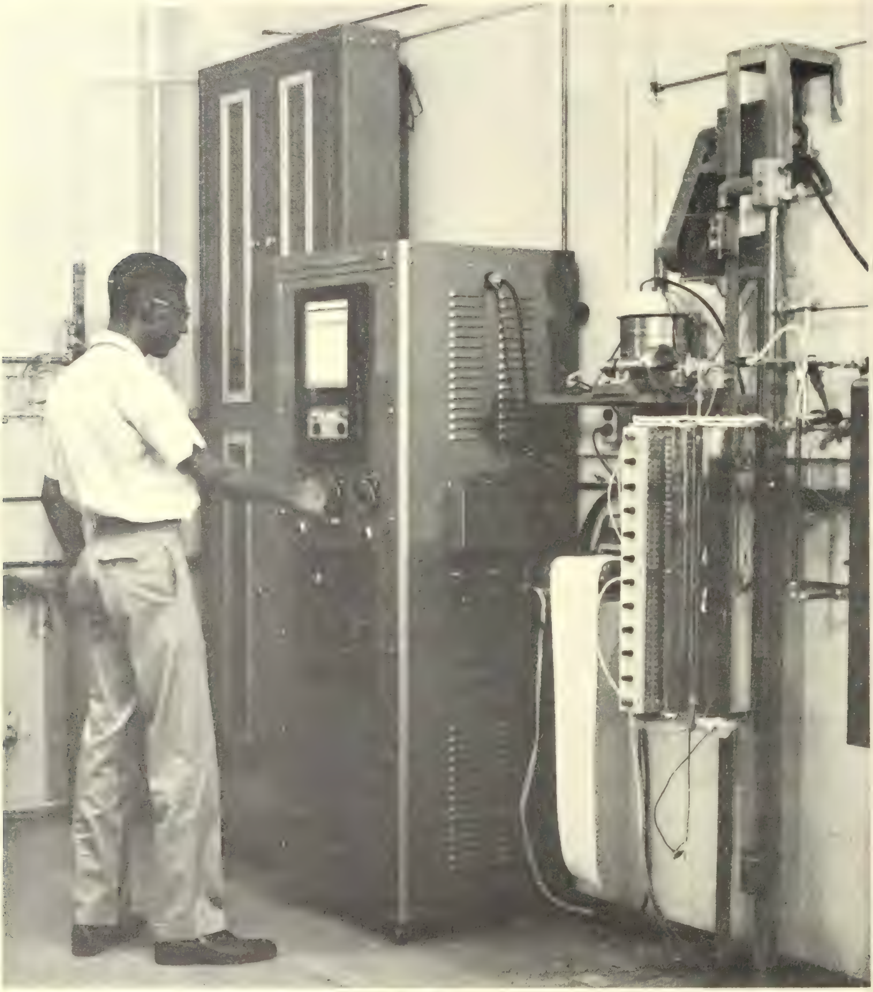
## Blast-Furnace Technology Advanced

Imaginative research conducted in recent years by the Bureau to increase blast-furnace efficiency and improve pig-iron quality gained new impetus early in the year with the signing of a cooperative agreement between the Bureau and Blast Furnace Research, Inc. This organization, composed of 22 major iron and steel producers, is contributing $2 million toward a 2-year research program using the Bureau's unique experimental blast furnace at Bruceton, Pa. Cooperative experiments are underway there on injecting many types of fuels into the furnace smelting zone, and additional studies are scheduled on operation at higher-than-normal furnace temperatures and pressures. This joint effort, proposed by the steel and iron firms, represents the determination of industry and Government to retain North American leadership in steelmaking technology.

## Low-Grade Materials Investigated

High-purity manganese was successfully obtained from Georgia umber, a low-grade source of the metal, using a simulated steel-mill waste product to extract the desired metal. Essentially all the iron occurring as a contaminant in this ore was separated in a laboratory-scale study, one of several aimed at evaluating promising processes for extracting manganese from the Nation's large low-grade and refractory resources.

About 90 percent of the phosphorus in a typical subgrade western ore was recovered as a high-grade concentrate in batch-scale flotation tests by the Bureau. Several western phosphate-rock



Metallurgists of the Bureau of Mines use this automatic equipment to measure and record the vapor pressures of certain metal compounds. A technician adjusts the recording unit, connected electrically to the measuring device at right.

producers have shown considerable interest in the results, offering full cooperation in supplying samples and in conducting tests to determine the acceptability of concentrates. Some companies have even demonstrated interest in testing on a larger scale in their own pilot plants.

Evaluation of several acid processes for recovering alumina from clay was completed in continuing Bureau research on domestic materials that constitute the probable aluminum ores of the future. These materials, and the processes selected through careful evaluation as most economic, will doubtless be used when present, higher grade deposits are exhausted.

## Lead-Bismuth Separation Promised

Preliminary tests were made of a method for removing bismuth from lead, using a submersible centrifuge at elevated temperatures. With this system better separation resulted than with standard hand-skimming methods. In another experiment, 95 percent of the copper and 97 percent of the lead were recovered from roasted lead blast-furnace matte by water and brine leaching. The resulting residues were relatively pure iron oxides.

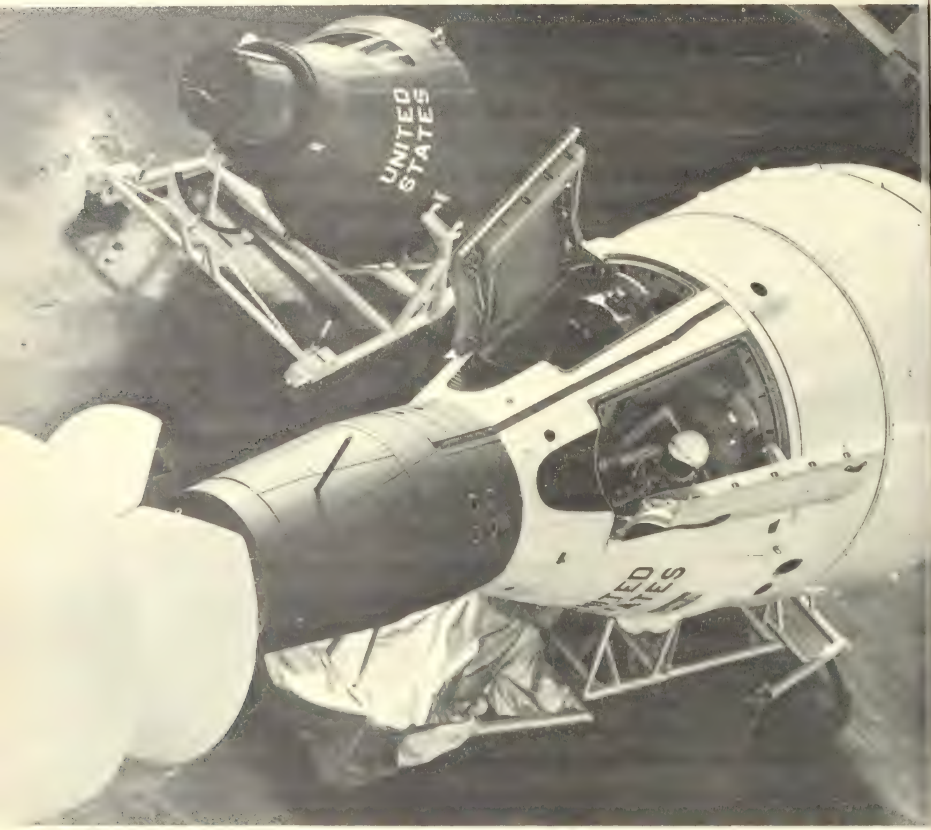
Work began on a new metallurgical process for recovering and separating minerals with small differences in specific gravity, such as ilmenite, rutile, and zircon. Important to the process is a new way to recover almost all the acetylene tetrabromide, a relatively expensive heavy liquid used as a separation medium.

## Purer Metals Produced

Bureau metallurgists continued a search for ultrapure metals needed to help meet growing demands for materials with exceptional properties. A method for producing superpure nickel, developed last year, was successfully enlarged to commercial scale, and the cobalt content of the nickel was reduced to less than 1 part per million. Another process for making pure nickel electrolytically from ferronickel was improved, while progress was made in removing iron from ferronickel by solvent extraction, and on arc melting electrorefined nickel to reduce carbon and other contaminants.

Vanadium metal much purer than that available commercially was produced in 50-pound ingots after successful scaling up of a process, developed earlier, that effectively utilizes such techniques as bomb reduction, chloride reduction, and electrorefining. Studies of vanadium compounds, conducted at very low temperatures, developed background information for future investigations of superconductor vanadium materials.

The purest beryllium ever made by the Bureau—so pure that all metallic impurities except calcium were below the limits of detection—was obtained using a double-electrorefining procedure with high-purity beryllium, refined from scrap, as feed material. Electrorefining also was employed successfully in producing high-purity titanium, a metal made available for important uses in U.S. spacecraft through Bureau research. The near-pure titanium was electrorefined from an alloy that was maintained as a liquid throughout the process.



Alloys containing Bureau-developed titanium are vital components of the space capsules MERCURY and GEMINI, pictured here side by side. The pressure vessels and the spars or structural members between the pressure vessels and the outer skins are of titanium in both capsules.—Courtesy NASA.

A method was devised for obtaining relatively pure cadmium from a scrap cadmium-zinc alloy; the crude alloy was reacted with magnesium to form a refractory magnesium-zinc compound and quantities of free cadmium, which then was distilled from the mixture.

Columbium with an oxygen content of less than 1 percent was successfully electrodeposited from an open cell. Previously, columbium of this quality could be electrodeposited only in closed cells containing inert atmospheres—a much more cumbersome and expensive method.

Research on the little-known rare-earth and yttrium metals was directed toward producing pure rare-earth compounds and ultra-high-purity metals. Near-pure neodymium metal was prepared that had high coalescence—that is, the metal formed relatively small, adhesive particles instead of loose flakes.

## Needs of Space Programs Emphasized

Other metallurgical research was directed toward separating metals whose similar properties make this process difficult. A new and simplified method was developed for separating columbium and tantalum; it promises to be commercially feasible. Columbium oxide is converted to volatile columbium oxychloride, leaving tantalum unaffected and facilitating recovery of both metals, which are in demand for important experimental applications in the Nation's space program. A patent was granted on a new Bureau process that fills a longfelt need for efficient and economical separation of molybdenum from tungsten—two other metals that are candidates for outer space. A new technique, developed for alloying thorium with nickel, is regarded as an important preliminary step toward production of higher purity thorium by electrorefining the alloy. Research on electrowinning uranium led to substantial increases in production and electrical efficiency.

In the tall, cylindrical cell a protective coating of molybdenum metal is being electrodeposited at 900° C. Guarded by a safety screen against accidental exposure to the high temperature, a Bureau of Mines scientist takes notes while another checks a recording device.

# PROGRESS IN NONMETALLICS

In nonmetallics, additional emphasis was placed on fundamenta work with synthetic micas. A novel method for determining mica melting points was developed, and initial determinations were made of the surface tension and density of molten fluorphlogopite to help scientists learn more about the properties of this type mica. Another variety of mica was successfully synthesized, and new data were reported on the melting temperatures of fluormicas, and on the preparation of synthetic mica from abundant, low-cost materials.

### Synthetic Mica Paper Improved

The search for ways to improve the electrical properties of reconstituted mica paper made from water-swelling synthetic micas resulted in development of an improved heat-treating cycle. A second commercial plant has adopted a Bureau method, developed in cooperation with industry, for recovering fine mica particles.

### Industry Adopts Kyanite Process

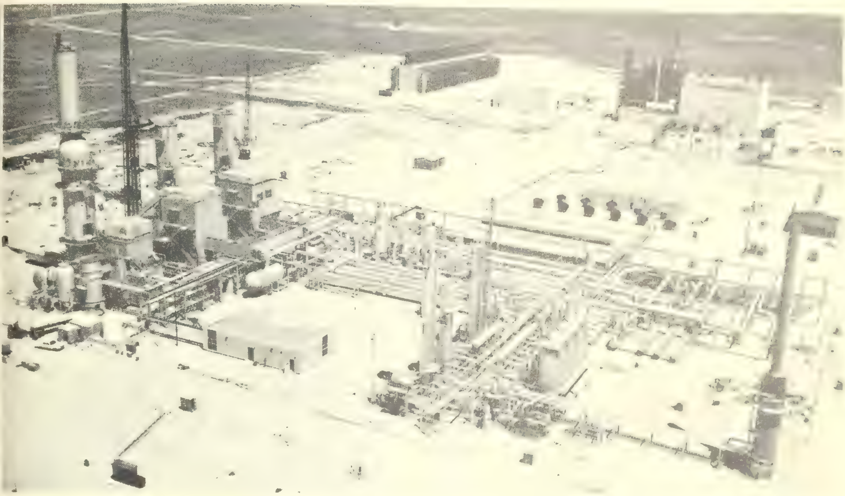
Cooperative research with private industry on kyanite-processing methods led to the construction of a flotation plant at Washington, Ga., for producing this valuable refractory material. About 9,000 tons of high-quality kyanite concentrate a year can be produced, using ore from the Graves Mountain deposit in Georgia's Lincoln County.

# HELIUM

A supply of helium for future needs was virtually assured during the year as the national helium conservation program went into effect.

### First "Conservation" Helium Delivered

Three private companies extracted 320 million cubic feet of crude helium from their natural gas and sold it to the Bureau of Mines under terms of 22-year contracts. The helium was delivered through a 425-mile pipeline to the Bureau's Cliffside gas-storage field near Amarillo, Tex. Ultimately, at least five privately owned and operated extraction plants will participate in the program, conserving helium that would otherwise have been wasted when natural gas containing small percentages of it was burned for fuel. The Nation's helium resources are more than adequate for now.



This Kansas installation, one of the privately owned and operated plants that extract crude helium from natural gas and sell it to the Bureau of Mines, can produce more than a billion cubic feet of crude helium a year.

However, demand for this element has quadrupled over the past 10 years and is still rising, while domestic reserves are both limited and irreplaceable.

## Bureau Output Remains High as Demand Continues

Production of helium at the five plants operated by the Bureau totaled 714.3 million cubic feet during the year. More than 600 million cubic feet of this grade A helium, 99.995 percent pure, was delivered to customers, mostly Government agencies. Approximately 60 percent was for missile and space programs, 14 percent for atomic energy applications, 2 percent for other Federal agencies, and the remaining 24 percent for non-Federal customers. Sale of helium at $35 per thousand cubic feet ultimately will pay for the entire conservation program.

## Helium Research Advanced

Studies during the year at the Bureau's Helium Research Center in Amarillo were directed toward discovering more about the properties of helium so that the wisest and most effective use may be made of limited resources. An important phase of the program is a worldwide search for all original papers, dating back to the beginning of the century, on helium's thermodynamic properties. Refined measuring techniques now enable scientists to detect gaps and errors in this fundamental knowledge. Further research can then be conducted to supply what is missing and correct what is wrong.

During the year the Bureau completed long-term research with the publication of phase-equilibrium data for helium-bearing natural gases. Begun in 1952, this work provided information used in designing the privately owned plants that now recover helium from natural gases for conservation. Also reported was the application to multiple-fluid mixtures, like crude helium, of the Burnett method of compressibility determinations. This technique makes possible the derivation of heat capacity values for gases and gas mixtures without using direct calorimetric measurements, which are less satisfactory and extremely difficult to make.

Also published was a table of supercompressibility factors for helium-nitrogen mixtures. This table sets standards for correcting volume measurements of crude helium purchased by the Bureau under the conservation program, thus contributing to the accuracy of calculations on which payments for crude helium deliveries are based.

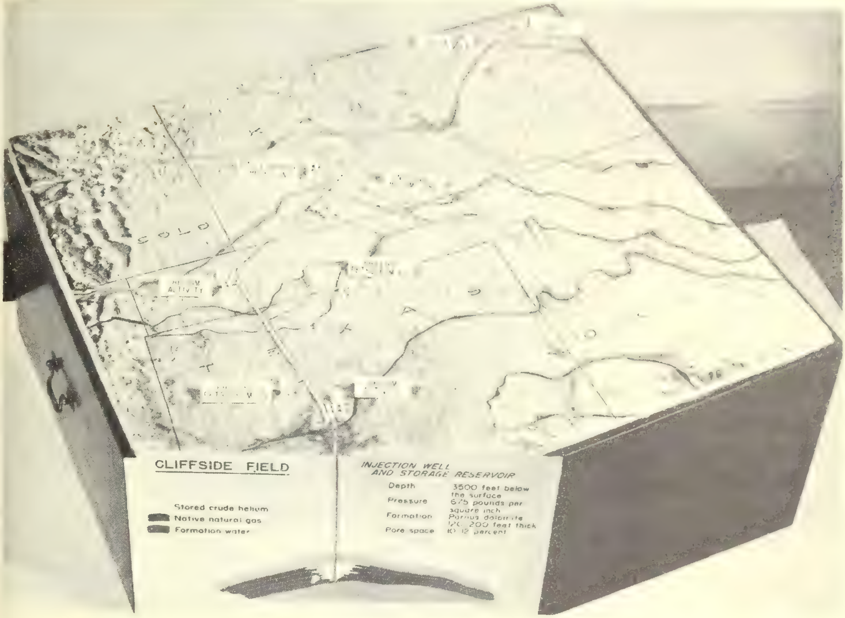
# PETROLEUM, NATURAL GAS, AND OIL SHALE

Intensified research was carried out during the year toward the Bureau's goal of petroleum and natural gas conservation. Development of better ways for producing, processing, and using these fuels was stressed, and laboratory studies continued on oil shale, which remains a promising future energy resource.

## Breakthrough in Production Research

Of major significance in the search for better ways to recover oil was the development of rapid, accurate methods for predicting the results of waterflooding—the secondary-recovery technique in which water is pumped into energy-depleted underground reservoirs to force oil toward producing wells. Bureau scientists developed procedures for using advanced physical and mathematical principles to perform calculations that once were too complex to be accomplished economically. As a result, the computer time required to arrive at final predictions has been greatly reduced.

A comprehensive study completed during the year also developed a more scientific approach to the problem of estimating the productive capacity of oil reservoirs. By analyzing reservoir per-


CLIFFSIDE FIELD
Stored crude helium
Native natural gas
Formation water
INJECTION WELL AND STORAGE RESERVOIR
Depth
3500 feet below the surface
Pressure
675 pounds per square inch
Formation
Porous dolomite 120-200 feet thick
Pore space
10-12 percent

This map-model shows the 425-mile Bureau of Mines pipeline built to deliver crude helium to the cliffside gas storage field. Three Bureau helium extraction and purification plants—labeled "Helium Activity"—are tied into the pipeline. Three of the five private plants scheduled to feed the pipeline with crude helium were operating by the end of fiscal year 1963.

formance and production decline in California fields operating at or near their maximum efficient rate, it now is possible to predict the performance of fields that are prorated—that is, restricted in production on a monthly basis.

## Experimental "Fireflood" Well Underway

Near Reno, Pa., a second field test of thermal recovery continued in cooperation with an oil-refining company. This method, sometimes called fireflooding, involves igniting part of the oil trapped in the porous rock of an underground reservoir and allowing the heat and pressure generated to drive the rest of the oil toward producing wells. The technique, also undergoing tests in other regions, is being examined for possible application to Appalachian oilfields where natural energy, once used to force oil into producing wells, has long since become depleted. At the Pennsylvania test site an observation well was cored 20 feet from the ignition well so that progress of the fireflood could be observed. Heavy crude oil will be injected later as a supplementary fuel during a second ignition test. Successful development of thermal recovery could achieve increased production from the Appalachian area, which contains the Nation's oldest oilfields.

### Economy Stimulated

Engineering studies performed on other reservoirs in the Appalachian area were responsible for increased drilling activity and oil production in Warren County, Pa. The Bureau's work indicated that the oil-bearing Glade sandstone formation in that region could be fractured by applying hydraulic pressure, thus permitting the oil to flow more freely. Use of this technique subsequently increased production and brought definite economic benefits to the area.

In other production studies during the year, an effective way was sought to remove oil and water that were blocking the porous sandstone of some natural gas reservoirs. Results indicated that methyl alcohol will remove such blocks without the aid of any other chemical additive, and can possibly be used to increase gas-well productivity.

### Oil-Analysis Work Gains

Joint research by the Bureau and the American Petroleum Institute on the identification of sulfur compounds in crude oil passed an important milestone during the year with publication of a comprehensive Bureau report on these compounds. Besides listing sulfur compounds thus far identified, the report reflects a shift in the interest of refiners from thiols, which are the most obnoxious of the sulfur compounds, to thiophenes, which account for the greatest amount of sulfur. The report is expected to be a valuable guide to areas for future research.

Identification of new compounds in crude oil also gives scientists additional knowledge of the origin, history, and characteristics of this versatile natural resource. Significant contributions were made to this knowledge during the year when a class of sulfur compounds was identified for the first time in crude oil.

### File of Oil Analyses Grows

During the year, 300 crude oil analyses were completed and added to the Bureau's open file. Containing over 6,000 separate analyses, this file now comprises the world's largest collection of analyses prepared according to a single standard. Eventually, the Bureau hopes to be able to correlate these data with geological reports so geological formations can be used as clues to predict the

An engineer operates equipment designed by the Bureau of Mines to deal with one of the hazards of oilfield waterflooding—premature breakthrough of injected water into oil-producing wells. The portable device injects a plugging material to minimize or prevent such accidents.

types of crude oil with which they might be associated. As part of this project, 1,225 crude oil data cards were delivered to the University of Wyoming's Data Processing Center for preparation of computer punchcards.

Noteworthy progress was made in obtaining thermodynamic facts needed by the petroleum and chemical industries for basic and applied research, and in designing and developing commercial processes. An especially significant achievement was the design of a gage for measuring extremely low vapor pressures with accuracy never before possible. Research also progressed toward developing superior rocket fuels for the Nation's space and defense efforts.

In January of 1963 the Bureau began gathering, compiling, and publishing data on refinery production of feedstocks used in manufacturing petrochemicals. Over half the Nation's chemical production consists of petrochemicals, and publication of detailed, comprehensive data on this subject is expected to fill a long-standing need of Government, the oil industry, and the general public.

## Oil-Shale Research Reported

During the past year work on oil shale was confined almost entirely to laboratory and bench-scale experimentation. Among the valuable results of this work was the discovery that the specific gravity of oil recovered from oil shale decreases uniformly as sample depth increases. This refers to shales in the Piceance Creek basin of Colorado, where several large oil companies propose to conduct in situ (in-place) combustion experiments in recovering oil from the shale.

In the field of shale-oil processing, Bureau studies focused principally on hydrogenation and hydrocracking with the expectation that these techniques will find commercial application in producing fuels and chemicals from shale oil.

On April 9, 1963, the Bureau dedicated its new Engineering and Physical Sciences Building at the Bartlesville (Okla.) Petroleum Research Center. Valued at over $2 million, the structure contains 55 laboratories, 36 offices, and a 300-seat auditorium

Practicing petroleum conservation, this crew is fracturing the rock of an underground oil reservoir to permit recovery of oil that might otherwise remain trapped. The Bureau of Mines studies such industrial operations to gain knowledge that will lead to improved oil-recovery methods.

where scientists from all over the world can meet to exchange information.

## COOPERATION WITH OTHER AGENCIES

The Bureau of Mines cooperated with various other Government agencies and participated in many significant Federal activities during fiscal 1963.

Among the most important of its cooperative efforts was participation in an interagency evaluation of future growth and employment opportunities in the national economy. This study, being coordinated by the Department of Labor's Bureau of Labor Statistics, utilizes an interindustry table in tracing the flow of goods and services through the economic system from the producers of raw materials to final consumers.

The Bureau is carrying out that part of the study regarding mining industries. Thus far, estimates have been prepared of the value of materials, services, labor, and power purchased by mining companies and the distribution of mine output to the various consuming sectors of the economy in 1958, the latest year for which comprehensive data are available. At year's end, projections were being made for 1970 of the inputs of material, services, labor, and power that will be required for each unit of mined (and milled or concentrated) product, and also of the percentage distribution of that product.

Other important cooperative work with Federal agencies during the year included:

> *For the Department of Justice:* Examination of a tungsten mine in Thailand. The Bureau prepared a report for use in defense of litigation by a Thai company to recover damages for alleged breach of contract by the United States. Successful defense could save as much as $2 million;
>
> *For the Office of Civil Defense:* Guidance of necessary research and preparation of a report on techniques and equipment recommended for rescue of personnel from nuclear-bomb-damage areas;
>
> *For the Army Research Office:* Assistance in selecting appropriate participants for a series of five unusual meetings on rapid excavation. Bureau staff members participated in all the meetings and also arranged for the presence of research personnel required for successful discussions of the subject;
>
> *For the Department of the Navy:* Consulting services on a deep excavation project;

*For the Atomic Energy Commission:* Research on producing hyperpure uranium and beryllium, on metallurgical problems relating to materials used in nuclear weapons systems, on disposal of radioactive wastes, and on the use of nuclear explosives for mining and excavation, of nuclear process heat for gasifying bituminous coal, and of radioisotopes in secondary-petroleum-recovery operations.

Additional cooperative work with the AEC and certain other agencies is discussed under the heading "Mineral Resource Activities."

Under the Accelerated Public Works program, the Bureau of Mines is cooperating with the Commonwealth of Pennsylvania in a strip-mine rehabilitation experiment. Located entirely on State-owned mined-out coal lands in the Appalachian highlands, the project is providing badly needed jobs in an economically depressed area. It is also a realistic model—showing the Nation how land scarred in extracting valuable minerals can be reclaimed so soil erosion will be controlled and stream pollution minimized. In this way, too, areas of natural beauty will be restored to help supply growing demands for healthful outdoor recreation.

The Bureau also cooperated with many nongovernmental organizations in such scientific events as the 25th Joint Solid Fuels Conference of the American Institute of Mining, Metallurgical, and Petroleum Engineers and the American Society of Mechanical Engineers; the American Carbon Conference (sponsored by the Bureau and the American Carbon Committee); the Gordon Research Conference on Coal Science; the Sixth International Mineral Processing Congress; the International Peat Congress; and a meeting of the International Standards Organization.

In addition, the Bureau participated in functions of the National Science Foundation, in the Interior Committee for Research and Development, and in AGARD, the NATO-sponsored advisory group for research and development.

## MINERAL RESOURCE ACTIVITIES

The Bureau of Mines program for conserving and developing mineral resources requires more than research on extraction, processing, and utilization. Bureau personnel must also investigate specific resources, study operating methods and costs, and conduct economic research on various aspects of the mineral industries. Besides helping to guide the Bureau's own research, these activi-

A Bureau of Mines technician breaks samples of low-grade iron ore from a Michigan outcrop. The Bureau is seeking ways to concentrate these ores for commercial use.

ties provide technical services and information to other Federal, State, and local agencies, to industry, and to citizens.

## Many Resources Inventoried

Bureau resource investigations during fiscal 1963 encompassed a wide range of minerals in many parts of the Nation. Among typical projects were:

Investigations of beryllium deposits in the West and Northeast;

Cooperative studies of promising deposits of clay and other industrial minerals in California;

A study of coal deposits in Boulder and Weld Counties, Colo. Nearly completed at year's end, this project was designed to aid in selecting thermal-power plant sites contiguous to possible future coal mines.

Bureau personnel also undertook special projects for other agencies, including the U.S. Army Engineers, the Bureau of Reclamation, the Bonneville Power Administration, the Area Redevelopment Administration, and the Atomic Energy Commission.

## Data on Old Oilfields Aid Search for New Reserves

Growing energy requirements have reawakened interest in eastern oilfields, particularly the Appalachian fields. Many petroleum companies have engaged in deeper drilling in established fields in the hope of encountering additional reserves of petroleum and natural gas. In cooperation with industry and with State agencies, the Bureau is accumulating, coordinating, and publishing detailed data on old oilfields, State by State. A report on West Virginia oilfields discovered before 1940, recently issued, contains comprehensive petroleum data for 79 fields, including maps, discovery date, size, formations, crude oil analyses, reservoir content, and rock characteristics, and describes secondary-recovery methods. Such information is especially helpful to small independent companies and to individual operators who cannot afford libraries or record-searching services, enabling them to conduct knowledgeable investigations for recoverable reserves that remain in the older oilfields. An equally comprehensive report is being compiled on the older oilfields of Ohio.

## Economic Research Reported

Growth of the national economy and increased industrialization have stimulated demand for detailed economic analyses. Recent mineral economic studies by the Bureau have covered aluminum fabrication in the Pacific Northwest, secondary nonferrous metals in California and Nevada, rare-earth metals in Western States, and the Pacific Northwest steel industry.

## River Basin Studies

The Bureau also participated in continuing studies of the Missouri River Basin. Reservoir sites were investigated, water uses were analyzed, and conservation methods employed by the mineral industry in the southern part of the basin were described. A comprehensive evaluation was made of the mineral resources of the Missouri River Basin between Fort Peck and Fort Benton, Mont.

The Bureau has nearly completed laboratory research on methods of sealing canal linings—part of the Missouri River Basin program. On the basis of successful bench-scale tests, the Bureau of Reclamation is planning comprehensive tests on actual canals.

Mineral deposits on selected Indian reservations in the Missouri River Basin are being investigated to determine if they can be developed to provide remunerative employment. As a result of previously completed Bureau studies, private industry is considering exploiting leonardite (naturally oxidized lignite) on the Fort Berthold Reservation in North Dakota and other minerals on the Blackfeet, Rocky Boys, and Fort Belknap Reservations in Montana and on the Standing Rock Reservation in South Dakota. Preliminary mineral examinations were completed on the Cheyenne River Reservation and the Lower Brule-Crow Creek Reservation in South Dakota.

## ADMINISTRATIVE ACCOMPLISHMENTS

The Bureau of Mines Automatic Data Processing Plan, 1963, based on five special studies and encompassing a 5-year plan for ADP systems in research, statistics, economics, and general administration, was completed and submitted to the Department for consideration.

An Arizona company practices conservation techniques by using water leaching to recover low-grade copper minerals from the soil of this hillside, once part of an underground copper mine. The Bureau of Mines studies such techniques so that new knowledge can be disseminated throughout the industry.

Newell Terry, Director of Personnel for the Department of the Interior, presents the Department's Annual Safety Award for 1962 to Marling J. Ankeny, Director of the Bureau of Mines. The award is given to the Bureau with the greatest annual percentage improvement in its accident frequency rate.

## Patents Granted

During the year, 12 new patents were granted to the Department of the Interior on inventions by Bureau of Mines technologists. In addition to methods for recovering zinc from scrap alloys, for recovering beryllium minerals from low-grade ores, and for making high-purity titanium, these patents covered a method for producing zirconium diboride, a high-temperature electrostatic precipitator, an apparatus for studying phase relationships of gases and gas mixtures, and a method for tracing the flow of reservoir fluids in which the tracer substances used are made radioactive after being injected underground, thus mimimizing radiation-exposure hazards. Scores of inquiries were received from the public on the radioactive-tracer technique alone.

### Manpower Utilization Enhanced

The Bureau of Mines Manpower and Fund Utilization Committee was established to review Bureau activities relating to staffing, management controls, and work measurement. The purpose was to focus special attention on obtaining the most effective manpower and fund utilization.

## MOTION PICTURES

### 12 Films Break Previous Showing Records

The industry-sponsored motion-picture program of the Bureau retained its nationwide popularity throughout the year. Approximately 4,250 prints were in circulation during fiscal 1963. They were shown more than 196,000 times to audiences totaling nearly 10 million, in addition to a reported television audience of almost 5 million. The year's most popular production was "California and Its Natural Resources," with films on uranium, the natural resources of Alaska, copper, and sulfur following in that order. Twelve films attained record high showings for the year.

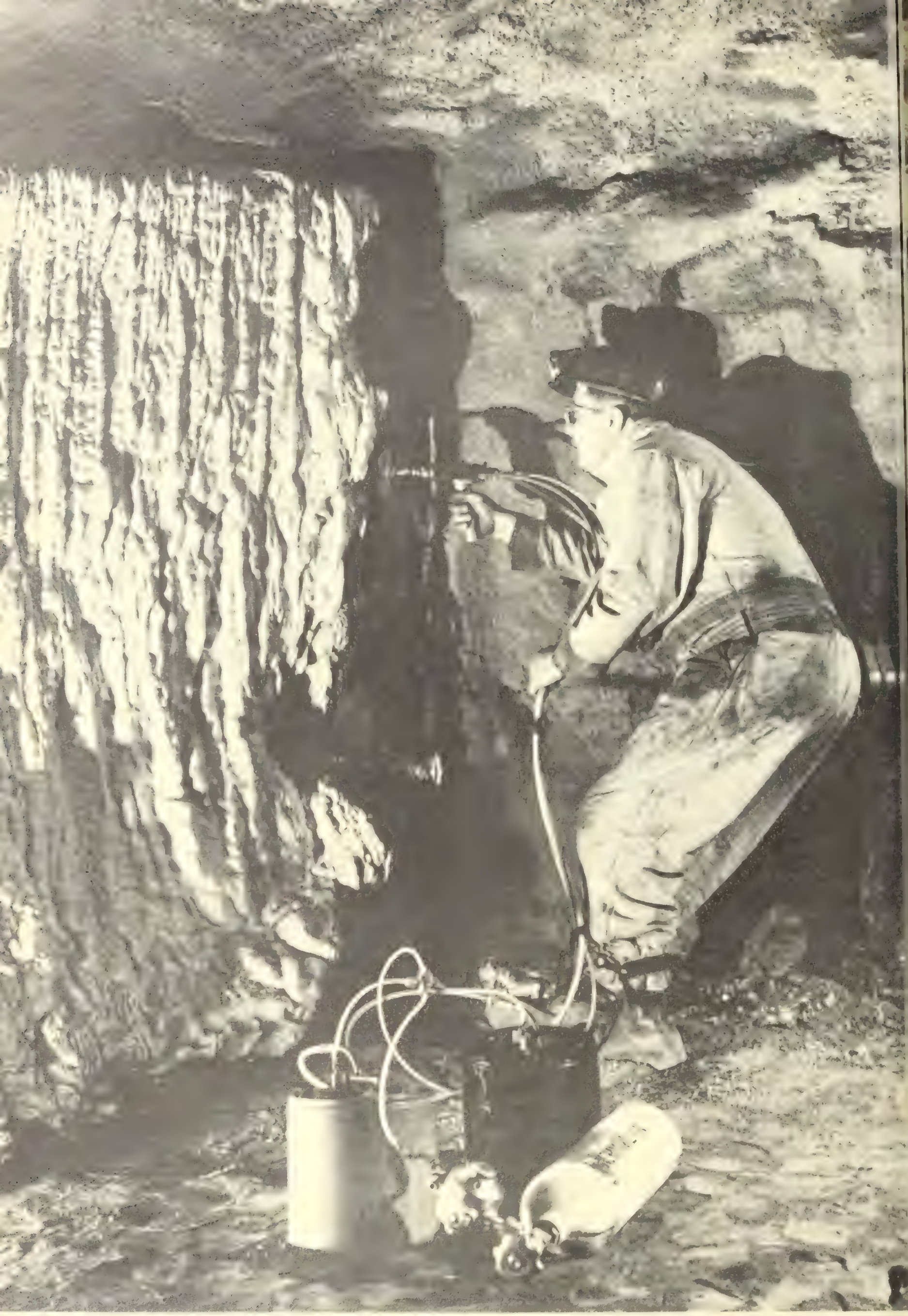
One new film, "The World of Phosphorus," was completed during the year, but too late for circulation in fiscal 1963. However, prints were expected to be available for loan early in fiscal 1964.

### International Prizewinner

After winning first prize at the Columbus, Ohio, Film Festival, the Bureau's recent production, "Copper, The Oldest Modern Metal," went on to win first prize as the best film on chemistry in the Seventh International Exhibit of Scientific Films at the Venice Film Festival, Italy, for 1962. In the 13th International Exhibit of Documentary Films of the Venice festival, it received a Special Award of Honor.

### New Films in Production

In addition to the motion picture on phosphorus, six other informational films telling the story of the U.S. mineral heritage and potential were in various stages of production during the year. The subjects of these 16-mm motion pictures, all sponsored by private industry and produced under Bureau supervision, include cast iron, potash, coal, helium, synthetic rubber from petroleum, and the natural resources of Washington State.



A Bureau of Mines technician uses portable equipment to block off a mine passage with waterproof, fire-resistant rigid foam. Developed by the Bureau last year, the plastic foam has recently proved its usefulness in such applications as mine-water control and firefighting.

# PUBLIC REPORTS

In fiscal year 1963, Bureau scientists and engineers wrote 753 technical manuscripts describing research in metallurgy, mining methods, health and safety, explosives, and other subjects concerned with conservation and development of minerals and with health and safety in the mineral and allied industries. Of these, 281 were articles for scientific journals, technical societies, and similar organizations.

# HEALTH AND SAFETY ACTIVITIES

Investigative, research, and educational programs in the health and safety field were again intensified during fiscal 1963 to keep pace with changing practices and methods in the mineral industries.

Field investigations were completed in the 2-year study of working conditions in metal and other noncoal mines required by Public Law 87–300, and the Bureau submitted data to the Secretary of the Interior's Mine Safety Study Board for its use in preparing the final report.

Further improvements were made in techniques for generating and applying rigid urethane foam, a substance that already is finding many important uses in mining. Other research continued on mine ventilation, on prevention of dust explosions, and on monitoring the concentration of combustible methane gas in underground mine atmospheres.

## Primary Hazards Attacked

An important research achievement promises a reliable method for forecasting failures of pillars, roofs, and ribs in mines subject to bumps and rock bursts. Bureau engineers designed encapsulated hydraulic-load cells that can be inserted in specially drilled holes in coal or rock that is under strain. Once in place, the cells monitor significant pressure changes on remotely located gages, giving sufficient advance warning of danger to permit precautionary action. Tests of the cells in several operating coal mines troubled with bumps and bursts were highly encouraging.

Studies of roof failures continued. At several operating coal mines gas pressures were measured within the roof strata in an effort to correlate high pressures with high failure rates. A hydraulically operated pressure-indicating apparatus with multiple packing rings was designed and constructed by Bureau technicians to measure gas pressures simultaneously at 1-foot intervals in a 14-foot borehole.

Encouraging progress also was made in detecting hidden fractures and inconsistencies in mine-roof strata using a compact, portable, transistorized sonar device. A treacherous coal mine roof was stabilized by injecting polyester resins to consolidate weak areas surrounding strata separations, fractures, and other voids. A similar project in a metal mine was undertaken to consolidate massive, fractured, metamorphic rocks.

## Rigid Foam Improved

New chemical formulations, spraying equipment, and application techniques were developed for safer and more effective use of rigid foams in mines. These foams expand when sprayed and "cure" within seconds, providing a tough cellular coating that adheres strongly to most mine surfaces, has low heat conductivity, and is highly resistant to the passage of air and water vapor. Thus, it is an effective aid to ventilation, prevents corrosion of metals, provides thermal insulation, and can be used for rapid construction of mine seals and non-load-bearing walls.

Comprehensive tests during the year provided assurances that the foam as now formulated has good flame-retarding qualities and that its toxic properties can be controlled. Chemicals and equipment developed in rigid foam research have now been adopted by industrial manufacturers, and Bureau-recommended systems for applying and using this remarkable material have been adopted in numerous coal and noncoal mines in the United States and foreign countries.

In a continuing cooperative study of mine air conditioning at a western copper mine, tests were begun to determine the insulating effectiveness of rigid foam applied to mine surfaces. Ventilation surveys were conducted in eight coal mines and one noncoal mine. The Bureau's fluid network analyzer (a special-purpose analog computer) was used to help plan major changes in the primary ventilation systems of four coal mines.

## Methane-Monitoring Progress

Two prototype detectors for monitoring underground concentrations of the combustible gas, methane, were tested in an operating coal mine. Results proved valuable in helping prepare specifications for five commercial methane-monitoring systems that will use different amplifying circuits to signal increases in methane concentration detected by gas-sensing elements called pellements. Another Bureau-developed detector operated successfully in controlled laboratory tests and field tests were scheduled. Continuous methane recorders performed satisfactorily for several months during a Bureau experiment in draining methane from a coal mine in advance of mining.

## Commercial Mining Equipment Tested

Improvements and innovations in mechanized mining equipment continued to require the Bureau's technical services and testing facilities to determine permissibility or acceptability of many types of machines. During the year permissibility approvals were issued for 85 electric-powered machines and devices and for 16 diesel-powered machines, all of which had been tested rigorously by the Bureau and found safe for underground use. Explosion-proof certifications were issued for 45 electrical enclosures and 2 diesel-powered units.

Hundreds of other approvals and certifications were extended during the year, and the Bureau conducted thousands of tests of equipment in explosive mixtures of natural gas and air. Other mining equipment and accessories tested for approval included conveyor belts, electric cables, roof drills with integral dust-collecting systems, and respiratory-protective devices.

## Health Studies Center on Dust Problems

A study of dust generation by mining equipment, in which different types of continuous-mining machines working in several coalbeds were observed, showed a need for continuing research on more effective dust control. Research on respiratory-protective devices were aided by the acquisition of improved and novel testing facilities, designed by Bureau scientists. Among these new facilities is a unique gas chamber where extreme changes in temperature and humidity can be made, thus making it possible to study physiological changes in simulated mine atmospheres.

## Fire-Control Research Combats Pollution

An experiment to determine the effectiveness of saturation sprinkling in controlling a burning mine-refuse dump was begun during the year at an active coal-mining property in Westmoreland County, Pa. The Department of Health, Education, and Welfare, the Commonwealth of Pennsylvania, and mine management are cooperating in the project, which will also be aimed at developing methods for abating air pollution caused by culm-bank fires and controlling the acidity of water that runs off the pile after sprinkling.

Temperature and humidity extremes often found in deep mines can be simulated in this Bureau of Mines test chamber, built to evaluate respiratory-protective devices. This composite view shows a test in progress, with scientists studying the man's physiological reactions by analyzing samples of his breath.

## Silicosis Problem Studied

Data collected during 1958–61 in joint field studies by the Bureau of Mines and the Public Health Service to evaluate the silicosis problem in underground metal mines were analyzed during the year. Investigations were conducted in 67 representative underground metal mines and included physical examinations by the

Under the direction of the Bureau of Mines, a protective trench is being dug between these Pennsylvainia homes and a fire in an abandoned coal mine. More than 30 such projects have been carried out in recent years under a cooperative agreement between the Department and the Commonwealth of Pennsylvania.

Public Health Service of approximately 15,000 workers. A joint report on the findings neared completion at the end of the year.

Investigations and inspections also continued in uranium mines, under Public Law 87–300, to evaluate health and safety hazards with particular attention to exposure of workers to radiation hazards. More than 200 inspections were conducted in underground uranium mines.

Bureau of Mines competency in research on mine and tunnel ventilation, mine gases, and internal combustion engines—based on experience dating back to the 1920's—was utilized in consultations held with representatives of the Bureau of Public Roads, Department of Commerce, to aid that agency in designing a proposed vehicular tunnel at Loveland Pass, Colo. More than 11,000 feet above sea level, it will be at a higher altitude than any other known vehicular tunnel; hence the danger from carbon monoxide in engine exhausts is enhanced, and more effective ventilation is required.

## Fires Controlled in Inactive Coal Deposits

During fiscal 1963, eight fire-control projects were completed—one on the public domain, two on Indian land, and five on private property. Work on three of these fires was begun earlier. At year's end work was in progress to control or extinguish six other fires—one on the public domain, one on Indian land, and four on private property.

Under Bureau guidance, 115 fires in inactive coal deposits have been extinguished or controlled since 1949, when funds were first appropriated for this purpose. Of these fires, 62 were on the public domain, Indian lands, or other properties where federally owned coal was threatened, and 53 were on private property, mostly in residential areas. This program has conserved an estimated 350 million tons of coal, about three-fourths of which is federally owned.

## Safety Education Forwarded

More than 5,200 mineral-industry workmen and officials completed training in the Bureau's various accident-prevention courses during the year. Continued emphasis on the nontechnical, psychological approach to accident-prevention training won outstanding endorsement from metal- and non-metal-mining industries, as well as from the coal-mining industry. At several operations 100 percent participation of the supervisors and workmen was attained. Workers completing Bureau of Mines first-aid and mine-rescue training during the year totaled 27,000.

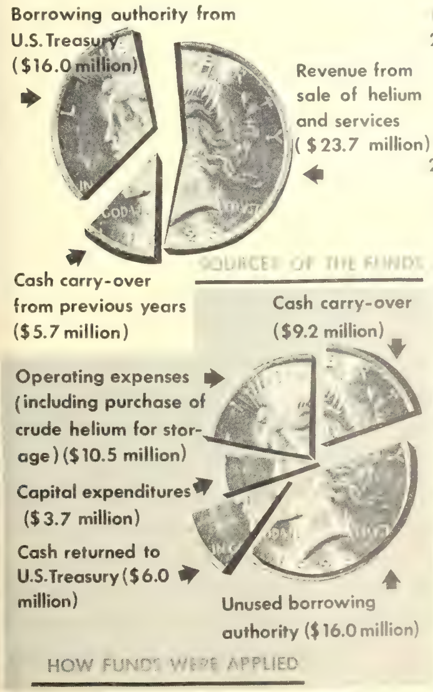
Motion pictures were produced during the year, as were numerous slides, posters, and other visual aids to safety training. Films in the Bureau's safety series were viewed by more than 70,000 mineral-industry workmen, and lecture demonstrations of fire, explosion, and mine-gas hazards were attended by approximately 60,000.

The Bureau continued leadership in the Holmes Safety Association by sponsoring 683 chapter and council meetings, at which total attendance exceeded 26,000.

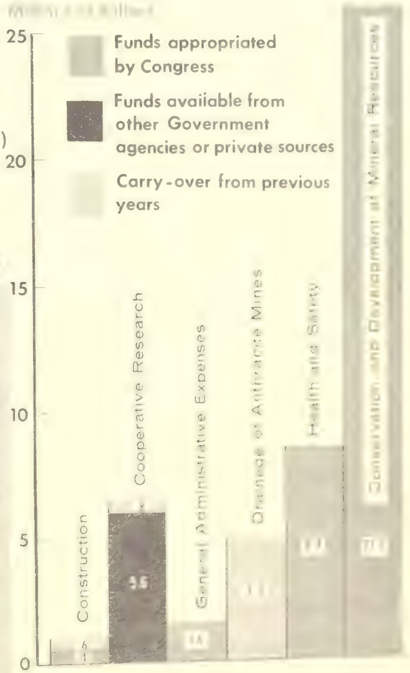
## Safety Contest Sponsorship Extended

Participation increased in each of seven annual nationwide safety competitions conducted by the Bureau for the mineral-extractive industries. Nearly 2,000 mines, quarries, and other mineral-industry operations were enrolled.

The American Mining Congress became a cosponsor with the Bureau of the 38-year-old National Safety Competition. A new contest, sponsored jointly with the National Limestone Institute, was begun during fiscal 1963.



HELIUM ACTIVITY FUNDS TOTALED $45.4 MILLON IN FISCAL 1963
(None appropriated directly by Congress)



OTHER FUNDS AVAILABLE TO THE BUREAU OF MINES IN FISCAL 1963
$49.7 MILLION

Periodic industrywide reports on injury experience in the various mineral industries were issued during the year. Injury and employment data for 1962 were collected from coal, metal, nonmetal, stone, and sand and gravel producers on a mandatory basis and were submitted voluntarily by members of the oil and gas coke, peat, and slag industries.

## Coal Mine Inspection Accomplishments

Fiscal 1963 marked the completion of almost 11 years of Federa coal mine inspection work authorized by the Federal Coal Mine Safety Act, which empowers Federal inspectors to inspect coal mines, report on hazards, recommend correction, and—in mines regularly employing more than 14 workers underground—enforce specific (title II) provisions designed to prevent major disasters.

During the year, 2,473 routine inspections were made of coal mines subject to title II. In addition, numerous followup inspections were made to determine whether previously cited violations of the mandatory provisions had been corrected.

Federal inspectors observed 7,874 violations of the mandatory safety provisions, many of which were corrected immediately and thus required no formal action. They issued 1,098 notices giving reasonable time to correct hazards, 150 granting time extensions, and 1,070 certifying that the dangers had been totally abated.

During the year, 102 orders were issued requiring withdrawal of men from all or part of 65 mines—76 orders at 52 mines because of imminent danger, and 26 at 13 mines because of failure to abate violations within a reasonable time. By comparison, 117 withdrawal orders were issued at 64 mines during fiscal year 1962.

Nine mines, previously considered nongassy, were reclassified as gassy.

More than 10,000 routine inspections were made of smaller title I mines (including 1,226 inspections at strip mines and 221 at auger mines) ; also conducted were numerous electrical, ventilation, dust, blasting, and related surveys, and investigations of all fatal accidents and of others resulting in severe injuries, mine fires, gas and dust ignitions, and miscellaneous hazardous conditions.

Preliminary reports show 287 coal mine fatalities in calendar year 1962, compared with 294 in calendar year 1961. Despite the drop in number of deaths, the fatality-frequency rate per million man-hours of exposure increased slightly, from 1.21 in 1961 to 1.22 in 1962. Two major coal mine disasters (five or more persons killed) occurred in fiscal year 1963. Both were explosions. One, in Pennsylvania, killed 37. The other, in West Virginia, killed 22.

In response to President Kennedy's concern over these two major coal mine disasters the Secretary of the Interior organized a special task force to determine what additional measures can be taken to provide increased assurance against such disasters and their attendant loss of life. The Bureau worked closely with the task force, which had nearly completed its study by the end of June.

# Office of Oil and Gas

## Jerome J. O'Brien, Director

The Office of Oil and Gas has primary responsibility for providing leadership and information on petroleum and natural and manufactured gas to Government agencies. Concurrently, it maintains liaison with those advisory committees established as channels of communication to obtain advice and information, as needed, from the petroleum and gas industries.

### Planning for Emergencies Occupied Staff

Planning to assure a state of readiness for any national emergency is a continuing assignment from the Secretary of the Interior.

Leadership of the Office in emergency preparedness was tested when a strict quarantine on the shipment of offensive military equipment to Cuba, aimed at halting development of Soviet nuclear missile bases there, was announced October 22, 1962, by the President. In support of the President, a stepup of readiness actions was put into effect to cope with possible oil- and gas-supply problems. A small group of Office of Oil and Gas employees was relocated to a special site with authority to exercise operational control over oil and gas supply, if necessary; Executive Reservists in the Petroleum and Gas Unit were alerted to be available for emergency service on short notice, and the remaining staff on duty in the Washington office prepared for possible establishment of an Emergency Petroleum and Gas Administration. Oil supply did not become a problem, but the United States was more adequately prepared to meet defense requirements than at any time in the past.

Recruitment and training of the Petroleum and Gas Executive Reserve has continued since the Interior Executive Reserve program was authorized in August 1956. At the close of the fiscal year, 117 individuals from oil and gas companies were designated Executive Reservists. Each reservist is qualified to participate in an executive capacity in the EPGA, which would be activated in a national emergency.

During the fiscal year, these reservists attended the third national training conference sponsored by the Office of Emergency Planning. Part of the session was devoted to a briefing by the Office of Oil and Gas on their role in the oil and gas emergency program. In December 1962, about 60 members of the Petroleum and Gas Executive Reserve from all parts of the country participated in a 3-day intensive training exercise conducted by the Office of Oil and Gas, at Battle Creek, Mich. A workshop was held involving the development of oil- and gas-supply requirements estimates based on damage factors used in a civil-military defense exercise. Reservists also were told about the possible impact of a nuclear attack on the country, its effect on oil and gas operations, and the nature of their duties following an attack.

Guidance was provided by the staff in Washington and by regional mobilization representatives to State officials and company personnel in developing and testing plans for protecting their employees and facilities in a national emergency.

## Other Defense Planning Accelerated

Besides work aimed at developing and staffing a standby Emergency Petroleum and Gas Administration, the Office is responsible for developing worldwide studies of petroleum and gas supply and demand under peacetime and emergency conditions.

In December 1962, the Office completed a study of the probable effect of a nuclear war upon the petroleum capabilities of the free world. This was requested by the Office of Emergency Planning and the Department of Defense. A supplemental analysis of petroleum supply and demand by U.S. regions and an evaluation of the transportation capabilities for movement of crude oil and petroleum products also were prepared.

Reports on nine other studies required by the Department of Defense in its defense planning were made by the Office. These concerned the ability of U.S. refineries to produce new fuels for military use or fuels having changed specifications. Additional reports concerned special foreign petroleum-supply problems.

With staff support from the Office of Oil and Gas, the Assistant Secretary—Mineral Resources was chairman of the U.S. Delegation for several international organizations regarding energy, including petroleum.

## Government-Industry Understanding of Petroleum Problems Sought

The Office of Oil and Gas relies on advice and cooperation from the petroleum and gas industries.

The National Petroleum Council, established 17 years ago to provide advice and counsel on petroleum and gas matters of national importance, completed four reports during fiscal 1963. Through the Council's work, the Federal Government had for the first time a consolidated report of factual information on the effects on the free world of the oil exports from the Soviet bloc, together with conclusions of the oil industry. Also, for the first time, the NPC reported on its survey of 86 chemicals produced by the petroleum and natural gas industries. Another report covered the status of domestic facilities for carrying natural gas and the movement of crude oil and petroleum products, by pipelines, barges, tank cars, and tank trucks. One report contained data on usable and nonusable oil inventories as related to petroleum storage capacity. The Office of Oil and Gas provided Government cochairmen for each of the NPC committees preparing these reports.

The Petroleum Security Subcommittee of the Foreign Petroleum Supply Committee gave technical advice to the Office in preparing some of the worldwide defense studies. This subcommittee was established early in 1962 to meet the need of U.S. defense agencies for information on petroleum requirement potentials of specific national security programs and for technical assistance in evaluating petroleum resources available to support such plans and programs.

In October 1962, a U.S. petroleum industry advisory committee was established to assure that information available to the U.S. oil industry was brought to bear on oil problems of the Organization for Economic Cooperation and Development. U.S. petroleum companies with international operations have representation on the Committee. They are appointed by the Assistant Secretary—Mineral Resources, who is chairman. The Office of Oil and Gas gave staff assistance. Committeemen were consulted on material contributed by the Office of Oil and Gas in drafting sections of an OECD report on oil.

The Secretary of the Interior approved the establishment of an Emergency Advisory Committee for Natural Gas to study and make recommendations which will assure an adequate supply of gas in a national emergency. The Committee, composed of 29 gas company officials, was appointed in November 1962.

Liaison with the oil-producing States is conducted through the Interstate Oil Compact Commission, the established forum for interstate cooperation to conserve oil and gas. The Assistant Secretary—Mineral Resources, or his alternate, who is the Director of the Office of Oil and Gas, participate in the IOCC meetings.

At the request of the Department of State, the Office of Oil and Gas prepared oil- and gas-supply and demand data as reference material for discussions between the United States and the United Kingdom.

# Office of Coal Research

## S. G. Lasky, Acting Director

The goal of the Office of Coal Research is to expand the use of coal—to the end that more coal is mined, more coal is sold, more miners and coal workers are restored to jobs and coal-mining communities are restored to health, and that coal makes its optimum contribution to the Nation's welfare.

The Office of Coal Research continued in fiscal 1963 to seek this goal through contract research with competent and recognized groups, including trade associations, research organizations, educational institutions, and agencies of States and political subdivisions of States, and by the encouragement of others to do similar research. OCR's present and contemplated contractors include the elite of American research capabilities, many of whom are, for the first time, turning their resources and energies to the problems of coal. The results of contract effort are made available to the public as promptly as possible, in the form of contractor's reports and presentation of scientific and technical papers at professional meetings and in the general and scientific press.

A General Technical Advisory Committee consisting of 20 leaders from the coal and associated industries, including the railroads and electric utilities, and from educational institutions advises the Secretary of the Interior and the Office of Coal Research on the development and direction of the program. Advice on individual projects is obtained both from this general committee and from recognized experts who assist the Office on strictly technical matters.

## 1963 RESEARCH PROGRAM

Seven contracts were in effect at the start of fiscal 1963. Six additional contracts were executed during the year and one was completed—leaving 12 contracts still active at year's end. The nature of the research, and the progress made, follow:

## Continuing Contracts From Fiscal 1962

*Bituminous Coal Research, Inc.*—Grinding and classifying equipment were installed and experiments were conducted to determine methods and costs of grinding a variety of coals to the fineness of flour, or talcum powder, for greater ease in pipeline transport, ash removal, and convenience of utilization. The experimental work is still under way and results are being analyzed.

*FMC Corp.*—Laboratory research to date has indicated that the goal of 80 gallons of usable liquids per ton of coal, plus usable solid fuel and gas having a high Btu value, may be produced. Further work is needed to determine economic feasibility.

*General Electric Co.*—The initial part of this project for converting coal into liquid and gaseous fuels by electrical discharges was substantially completed. Work was proceeding on the design of larger equipment that will obtain data required for an eventual scaleup to a design of pilot-plant operation. The results thus far indicate a potentially commercial process.

*Georgia Institute of Technology.*—This contract was completed. Indications are that very short-time high-temperature treatment of coal does not produce significant yields of useful products. Nevertheless, the resulting information will be useful in guiding research on other conversion processes.

*The Ralph M. Parsons Co.*—The first phase of this contract, evaluation of a new process for producing gasoline from coal, was completed. Results indicate a price about one-half that of any previous coal-to-gasoline process. Negotiations with another contractor for constructing and operating a pilot plant were nearing completion.

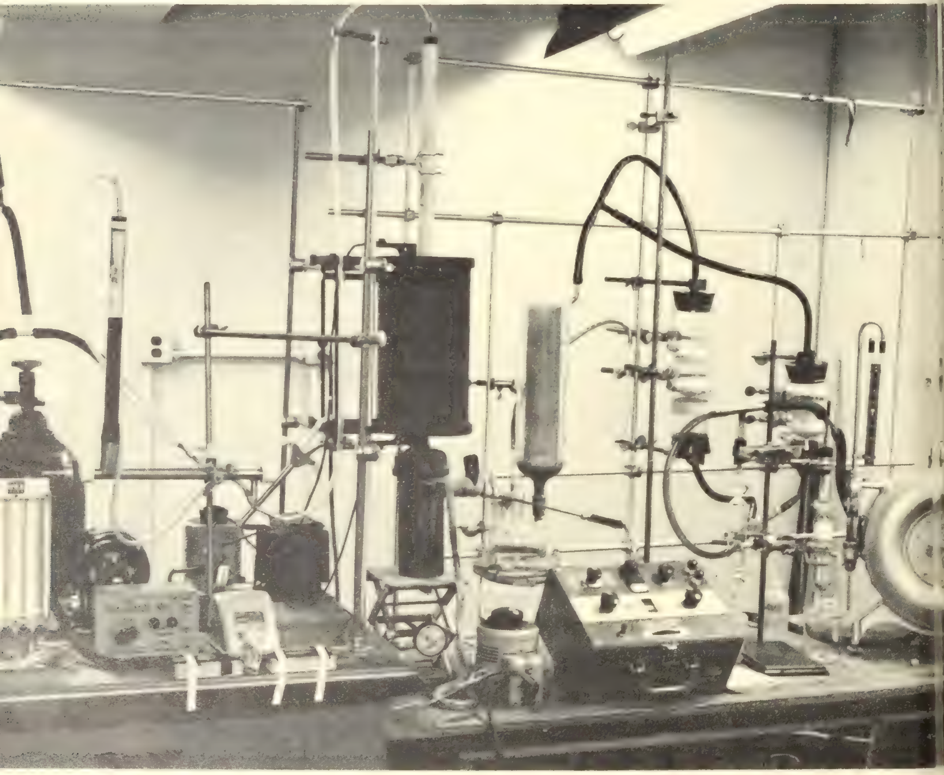
*Pope, Evans & Robbins.*—Preliminary designs for a new, automated, completely integrated, coal-fired industrial heating plant for factories, apartments, and other large buildings were completed. Certain engineers believe that plants of this design can be built at two-thirds the cost of conventional coal equipment of equivalent capacity and that the new design can be shop constructed, rather than field erected, for capacities about three times the capacity of available "packaged" units.

*Virginia Polytechnic Institute.*—The contractor has developed preliminary mathematical formulas and models that permit computer simulation of underground coal-production operation with a high degree of accuracy. Observers believe that this work, when completed in fiscal 1964, will be useful in reducing the cost of mining coal and improving the accuracy and usability of mining engineering technology.

## New Contracts in Fiscal 1963

*Montana State College.*—This project is determining the yield and composition of liquid and gaseous products obtained from carbonizing a variety of coals. The equipment used is of a unique type designed and built at Montana State College. This contract supports continuing work that could lead to extraction of valuable byproducts from western coals.

*Robert R. Nathan Associates.*—The contractor had nearly completed a study of the worldwide export potential for U.S. coal and the identification of impediments to the full achievement of that potential. The report will recommend Government and industry actions helpful in expanding coal exports and will include detailed studies of potentially attractive foreign markets.



This coal-pyrolysis reactor, used in research, operates at temperatures up to 2200° F with residence times of 100 milliseconds.

*Spencer Chemical Co.*—The contractor is conducting bench-scale and pilot-plant scale experiments to determine the feasibility of upgrading coal by dissolving the coal, separating the various constitutents (including ash), and then reconstituting the solids. Among the objectives are the preparation of a coal free of ash and low in sulfur and one than can be transported readily in a finely divided state, and also the recovery of useful minerals from the ash and other impurities. Bench-scale work has shown that the ash content can be reduced to approximately 0.1 percent at commercially attractive prices. Equipment is being constructed to validate the data on a larger scale.

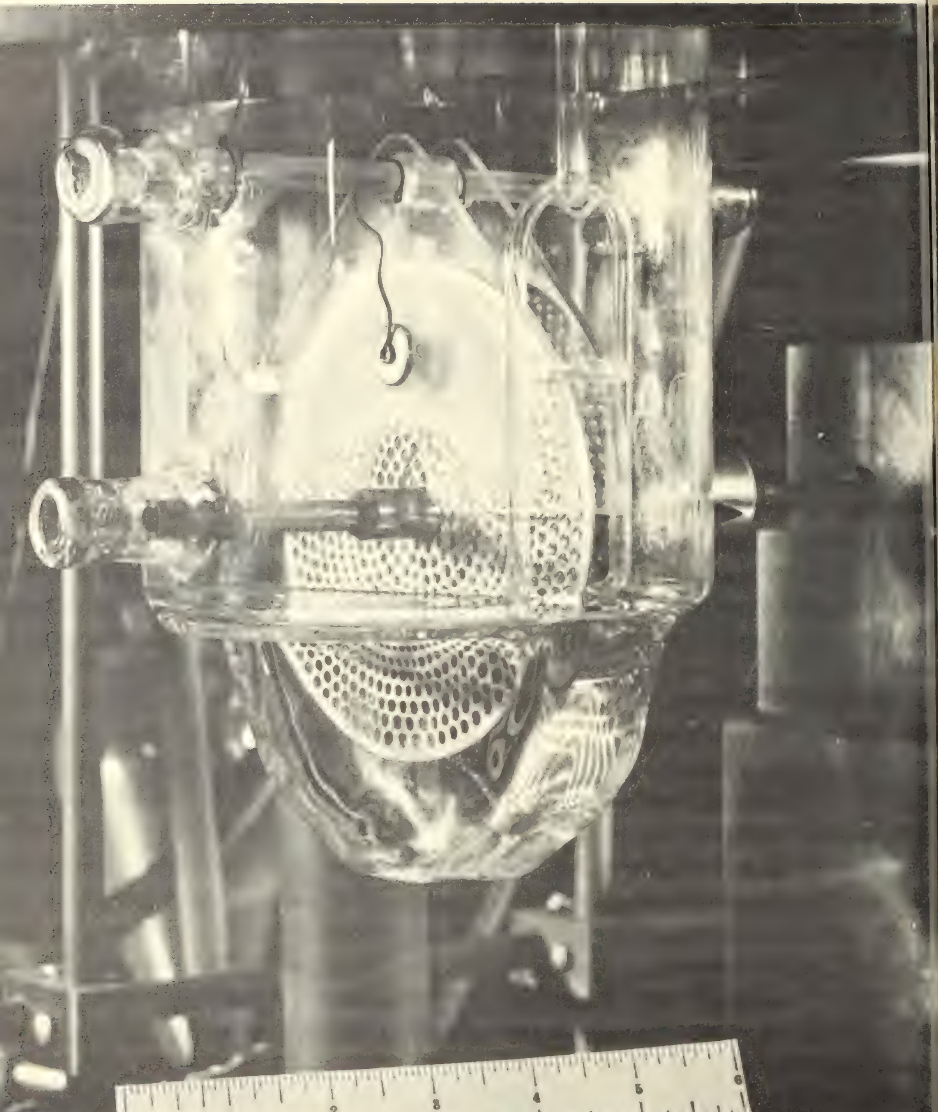
*University of Utah.*—This project, cosponsored by the State of Utah, is determining the economic yield of gases, liquid fuels, and chemicals from a wide variety of western coals. Among the reactions to be investigated are electric arc and flash photolysis. This work could be the basis for adapting various coal-conversion processes to western coals.

*West Virginia University.*—The contractor is determining and evaluating the economics and methods of mining and recovering metals, minerals, and other byproducts contained in coals or located in strata immediately adjacent to the coal seam. Several such materials were tentatively assessed as being commercially exploitable.

*Westinghouse Electric Co.*—This contract is concerned with developing a fuel cell operating on coal or a coal-derived gas. Bench-scale experimental work, if successful, will lead to construction and operation of a unit capable of powering a 100-watt light bulb, and eventually to the construction of a commercial prototype 1,000 times larger.

## SMALL STAFF COORDINATES PROGRAM

The Office of Coal Research program is directed toward commercialization of results—of benefit to large and small coal producers alike. Under the guidance of Congress, the Office recognizes the potential importance of coal in the American energy market. The program now in effect is administered and controlled with a staff of less than 25 persons. Despite the relatively uncertain nature of research and development work, it appears that some of OCR's present contracts will succeed in achieving breakthrough-



This experimental 4-inch diameter rotating-disc corona reactor is used for conversion of coal to liquids and gases.

of significance to the future of the coal industry and the U.S. economy. Future plans include economic, marketing, and transportation studies to help coal find its full place in the economy, studies to bolster its position in existing combustion markets, and, through projects to determine the true nature of coal, to develop new products and new markets not dreamed of today.

A quartz-spring balance is used to determine time-weight loss characteristics of a coal-catalyst mixture being reduced in a hydrogen atmosphere.

# Office of Minerals Exploration

George Fumich, Jr., Director

Revived interest by the mining industry seeking new sources of gold and silver made fiscal 1963 another record-breaking year for the assistance program of the Office of Minerals Exploration. Eighteen new contracts were executed authorizing $1,635,605 in exploration work. Mercury, molybdenum, and iron ore also figured in the 1963 contracts.

With the certification of possible production on one more OME project, the number certified stood at three and the value of recoverable minerals in the inferred ore reserves found on these projects was estimated at $15 million. This value was more than four times the total of $3,700,000 committed to the OME since its beginning in 1958.

Royalty payments during the year on production from the former Defense Minerals Exploration Administration (DMEA) and OME exploration projects were $284,067.

Stabilization payments totaling $1,417,702.89 were made to 71 small domestic producers of lead and zinc who qualified under Public Law 87–347.

## PROGRAM FUNCTIONS

The OME is presently responsible for two programs—one for exploration assistance, the other for lead and zinc mining stabilization.

### Exploration Assistance

Financial assistance is provided private industry under Public Law 85–701 to encourage exporation for domestic mineral reserves, except organic fuels. The OME contracts with qualified applicants to explore for one or more of the 35 eligible mineral commodities. It pays one-half the cost of approved exploration work not exceeding $250,000 on any single contract. The Government's share of the cost is repayable with interest by a royalty of 5 percent on production from the property. If there is no production, no repayment is required.

The OME also administers projects with royalty obligations remaining from a similar program conducted by the Department's former Defense Minerals Exploration Administration, under the Defense Production Act of 1950, as amended.

### Lead and Zinc Stabilization

Under the lead and zinc mining stabilization program authorized by Public Law 87–347, qualified small domestic producers of lead and zinc may receive stabilization payments on their production of each metal up to specified tonnages and within the total amount authorized by the act for each calendar year 1962 through 1965. Responsibility for operating this program has been delegated to the General Services Administration.

## OME OPERATIONS

During fiscal 1963, OME received 57 applications requesting financial assistance for exploration estimated to cost $6,384,695. These brought the totals for the program to 317 applications received proposing projects in 28 States to explore for 31 minerals and estimated to cost $28,672,810. Actions taken on these applications are shown in the following tables:

*Disposition of OME applications*

| Action | Number | |
|---|---|---|
| | Fiscal year 1963 | Program total |
| Received | 57 | 317 |
| Denied | 30 | 128 |
| Withdrawn | 28 | 95 |
| Contracts executed | 18 | 69 |
| Pending on June 30, 1963 | 25 | |

Of the 18 contracts executed during the year, 10 were for gold, 4 for silver, 1 for iron ore, 1 for molybdenum, and 2 for mercury.

Program totals are now 69 contracts for 13 mineral commodities in 18 States. Details of contract actions are summarized in the following tables:

*Summary of the OME program*

| Contracts | Fiscal 1963 | | | Program through June 30, 1963 | | | | |
|---|---|---|---|---|---|---|---|---|
| | Number | Total cost | Government participation | Number | Total cost | Government participation | | |
| | | | | | | Approved | Spent | Repaid |
| Executed, as amended | 18 | $1, 635, 605 | $817, 802 | 69 | $4, 438, 691 | $2, 219, 345 | $763, 488 | [illegible] |
| Certified as possible production | 1 | 48, 186 | 24, 093 | 3 | 95, 486 | 47, 743 | 31, 683 | [illegible] |
| Terminated, not certified | 7 | 548, 465 | 274, 233 | 23 | 966, 345 | 483, 172 | [illegible] | [illegible] |
| Canceled | 2 | 129, 260 | 64, 630 | 7 | 328, 370 | 164, 185 | | |
| n force as of June 30, 1963 | | | | 36 | 3, 048, 490 | 1, 524, 245 | 521, 263 | [illegible] |

## DMEA OPERATIONS

Obligations to pay royalty on production were outstanding on 293 DMEA projects at the close of the year. The royalty obligation was removed on 73 projects during the year, including 3 which completed repayment of the Government's share. A total of 74 projects had completed repayment by the end of the year. Royalty payments for the year were $263,736, bringing the total for the DMEA program to $4,587,351.

*Summary of DMEA contract data*

| Contracts | Number | Total cost | Government participation | | |
|---|---|---|---|---|---|
| | | | Approved | Spent | Repaid |
| Executed, as amended | 1, 159 | $56, 770, 493 | $34, 805, 244 | $23, 346, 029 | $4, 587, 351 |
| Certified as discoveries | 399 | 30, 347, 376 | 18, 634, 520 | 14, 941, 006 | [illegible] |
| Terminated, not certified | 677 | 24, 177, 658 | 14, 802, 234 | [illegible] | [illegible] |
| Canceled | 83 | 2, 245, 459 | 1, 368, 490 | | ------ |

## LEAD AND ZINC STABILIZATION OPERATIONS

During the year, 121 applications for participation in the Lead and Zinc Stabilization Program were received from 12 States. Of these, 60 were certified as eligible for payments on calendar year 1962 production and 96 for payments on calendar year 1963 through 1965 production. Payments were made to 55 participants on 1962 production and to 56 on 1963 production. The following table shows the activity under this program to date:

*Summary of the lead and zinc stabilization program, June 30, 1963*

| Calendar year | Maximum eligible tonnage | | | Production (tons) | | | Payments | | |
|---|---|---|---|---|---|---|---|---|---|
| | Lead | Zinc | Combined | Lead | Zinc | Combined | Lead | Zinc | Total |
| 1962 (12 months) | 19, 413 | 24, 994 | 44, 407 | 8, 241 | 12, 910 | 21, 151 | $602, 010 | $410, 571 | $1, 012, 581 |
| 1963 (6 months) | 24, 699 | 31, 565 | 56, 264 | 3, 170 | 6, 452 | 9, 622 | 192, 219 | 212, 903 | 405, 122 |
| Total | 44, 112 | 56, 559 | 100, 671 | 11, 411 | 19, 362 | 30, 773 | 794, 229 | 623, 474 | 1, 417, 703 |

# Office of Minerals and Solid Fuels

## William E. S. Flory, Director

The Office of Minerals and Solid Fuels is responsible for planning and programing to assure an adequate supply of minerals and solid fuels for essential civilian and military requirements in a defense emergency. The Office also provides advice and staff assistance to the Secretary on policy matters affecting the minerals and solid fuels industries. During fiscal 1963, mobilization base studies, supply studies, and other special evaluations were made on minerals and solid fuels which presented problems of concern to the Department.

The Office represented the Department on the Interdepartmental Materials Advisory Committee reviewing stockpile objectives and other problems regarding stockpiling. The Office also represented the Department on the Supplemental Stockpile Advisory Committee for Barter and its subcommittee on materials, and on the Interdepartmental Committee on the Soft Coal Industry.

Staff work was supplied the Department on metals and minerals export control matters for the Operating Committee of the Advisory Committee on Export Policy chaired by the Department of Commerce.

### Stockpiling Studies Undertaken

The OMSF likewise is responsible for formulating departmental recommendations on proposed disposals of metals and minerals from Government stockpiles and represented the Department in interagency consultations and in consultations with industry on disposal problems.

At year's end, supply studies were being made for 26 stockpiled materials for transmittal to the Office of Emergency Planning for interagency review to determine the adequacy of existing stockpile objectives.

## Supply-Requirements Data Provided

Requirements of the minerals and solid fuels industries for controlled materials for maintenance, repair and operations, for construction and for manpower, under conventional wartime conditions were supplied to OEP for a national supply-requirements study being conducted by that agency.

## Industry Evaluation Board Analyses Aided

The OMSF worked on preparation and review of Industry Evaluation Board analyses of metals and minerals for which the Office is responsible. A new format for the presentation of pertinent information on certain categories of mineral raw materials was developed by the staff of OMSF for the Board.

## Executive Reserve Program Continues

The senior staff of OMSF and 19 of its Executive Reservists attended the National Defense Executive Reserve Conference, after which the Office conducted an indoctrination program for the OMSF reservists.

During the Cuban crisis, all the reservists in the minerals and solid fuels units of OMSF were alerted and instructed on the measures which would be put into effect should a defense emergency be declared.

## Input Data Prepared

The OMSF assembled and maintained basic input data on metals, minerals and solid fuels for use in computing machines for assessing surviving resources and industrial facilities in the event of an enemy attack. Input data for anthracite use was completed and data for byproduct and beehive coke were updated. A revision was underway for approximately 750 metals and minerals facilities.

## Security Publications Issued

To stimulate disaster preparedness and to control and maintain continuity of production of minerals and solid fuels and capacity for essential users in an emergency, two publications on industrial security were sent all major producing companies and associations.

# Office of Geography

## Meredith F. Burrill, Director

More than 280,000 foreign names were processed according to policies of the Board on Geographic Names for standardization by the Board and the Secretary of the Interior and for publication in gazetteers of Brazil, Cuba, Sweden, Belgium, Laos, Cambodia, China, and North Korea.

In 1963 substantial progress was made toward international standardization of geographic names through consultations with the Permanent Committee on Geographical Names for British Official Use (London) and participation in the United Nations Technical Conference on the International Map of the World on the Millionth Scale (Bonn). Work progressed on a joint Board on Geographic Names-Survey of Kenya gazetter of Kenya. Romanization systems for Hebrew, Greek, and Amharic were reviewed and steps were taken to modify them with a view toward wider international use.

# Board on Geographic Names

Edward P. Cliff, Chairman
Meredith F. Burrill, Executive Secretary

In 1963 the Board and its standing committees took appropriate actions to establish or modify nomenclature policies and to standardize the foreign and domestic geographic names required by the Federal Government. Through its staffs it maintained inquiries services providing official names and names information and also provided related services to the general public.

An Advisory Committee on Undersea Features was established in 1963 to develop policies for standardizing ocean-bottom nomenclature and to recommend undersea feature names to the Board. The Board's Advisory Committees on Antarctic Names and on Arabic and Persian continued active in their special fields of interest.

# Oil Import Administration

## J. Cordell Moore, Administrator

The Oil Import Administration was established in the Department as the result of a Presidential proclamation issued March 10, 1959.

In administering the oil import program, the Department seeks to insure a stable, healthy petroleum industry in the United States capable of exploring for and developing new domestic petroleum reserves necessary for the national security.

During the year, the Oil Import Administration received and processed over 6,200 reports from importing firms submitted in compliance with section 18 of the oil import regulations. It extracted and tabulated oil import data from these reports for statistical and administrative purposes. The Administration prepared 20 detailed documents, which were released to the public, showing oil import facts on an individual company basis by importing areas and including refinery and terminal "inputs" of crude oil and residual fuel oil, respectively. It also prepared and released semiannual bulletins on total oil imports, listing the country of origin of all imports and the percentage ratio each exporting country shares in the U.S. oil import market.

In addition, the agency received, analyzed, and recorded 530 "exchange agreements" covering planned action by authorized crude oil importers to exchange foreign oil for domestic oil for processing in their own refineries. This type exchange is permitted by the oil import program subject to restrictions and provisions under the oil import regulations. Analyses of these exchange agreements are necessary to assure regulation compliance.

Under section 8 of the oil import regulations, the Administration prepared and forwarded 174 letters of authorization to collectors of customs granting approval for small quantities of foreign oil to enter without an import license. Authorization requests were received covering individual cases and were evaluated and acted upon on the basis of facts presented in each case.

The agency held one public hearing during the year in Los Angeles, Calif., concerning the oil import program for the west coast.

Under an invitation extended by the Chairman of the Oil Import Appeals Board, dated April 10, 1962, the Oil Import Administration submitted detailed written comments to the Board on 31 petitions for modifications of allocations which the Board had received.

During the year, the Oil Import Administration issued 1,575 licenses to eligible importers for importation of crude petroleum and its derivatives according to commodity type.

Prior to the close of the year, the Administrator announced overall oil import levels for the allocation period July 1, 1963, through December 31, 1963, and issued individual oil import allocations to 196 eligible importers for crude oil and finished products other than residual fuel oil to be used as fuel. For the allocation period April 1, 1963, through March 31, 1964, individual import allocations were issued to 52 eligible importers of residual fuel oil to be used as fuel.

The agency prepared and promulgated new oil import regulations and three amendments to the oil import regulations, and made changes in the broad policy of the existing Presidential proclamation which involved adjustments in the method of allocating crude oil, unfinished oils, and residual fuel oil to be used as fuel.

# Office of the Administrative Assistant Secretary

## D. Otis Beasley, Administrative Assistant Secretary

DEPARTMENT OF THE INTERIO

# Office of the Administrative Assistant Secretary

D. Otis Beasley, Administrative Assistant Secretary

The Administrative Assistant Secretary directs seven staff divisions: Administrative Services, Budget, Management Research, Personnel Management, Property Management, Security, and Survey and Review.

## Administrative Services

During the year, the Division of Administrative Services provided staff guidance for all administrative services programs and activities of the Department, and operated these services for all units of the Department in the Washington metropolitan area. Operations continued to increase with expanded program activities of the Department.

The Central Library enlarged the volume of its holdings and services by more than 5 percent over 1962, established new procedures to expedite translations of foreign-language publications, selected six libraries to serve as official depositories (as defined in Public Law 579 of the 87th Cong.), installed rapid-copy facsimile reproduction equipment for better service, and assumed responsibility for compiling certain scientific information for the Federal Council of Science and Technology.

Installation of a multistation collator, plus improvement to other equipment, enabled the central duplicating plant to reduce delivery times and increase output without corresponding increase in personnel costs.

More than 2,100 Department employees in the Washington, D.C. metropolitan area received a total of 3,918 injections in the De-

Created by Act of Congress in 1849, the Department of the Interior is responsible for a wide variety of programs concerned with the intelligent management, sound conservation, and wise development of America's natural resources.

partment's first mass influenza inoculation program at a cost of 50 cents each.

## Budget

The Division of Budget continued to hold primary staff responsibility for budget activities of the Department.

Budget activities for the year included the processing of two regular budgets: one for the Bureau of Reclamation and power marketing agencies, and one for the other bureaus. In addition, supplemental budgets were written.

The Division developed procedures and revised presentation for budget review by the Secretary and Assistant Secretaries. This presentation provided a means whereby functional programs which cross bureau responsibilities were consolidated to allow for policy analysis and decision. It also provided for a clear presentation of long-range programing. The Division provided leadership and staff assistance to participating bureaus in the reporting aspects of the Accelerated Public Works program, as required by the Area Redevelopment Administration of the Department of Commerce.

## Survey and Review

The Office of Survey and Review was established during the year to strengthen management processes in the Department with special emphasis upon financial policies and methods, procedural modernization, auditing policies, contract review, and other potentially sensitive subjects. Creation of this Office was one of the most significant management improvements during the year. Through direct audit and analysis, this Office provided essential facts and professional advisory assistance to the secretariat. Complementing the audit and analysis responsibilities was an investigative division which provided usual administrative services as well as those investigations related to complaints of employee misconduct and serious irregularities.

The Office of Survey and Review also assumed responsibility for functions formerly identified with the Division of Inspection. They included establishment and enforcement of ethical standards for employee behavior and official operations. A departmentwide systematic inspection activity was administered for this purpose. The responsibilities also extended to developmental and compliance activities regarding Federal employment phases of the equal employment opportunity policy under Executive Order 10925, as amended. In applying this policy, the Department placed increased emphasis on policy understanding and motivation at all levels of supervision. It is the Department's aim to promote affirmative application of equal opportunity concepts without neglecting fair and impartial prosecution of complaint actions.

## Management Research

The varied activities of the Division of Management Research during the past year were highlighted by new emphasis on its responsibility for staff supervision over automatic data-processing (ADP) activities of the bureaus and offices. A staff member, with assistance from bureau and office representatives, completed an inventory of the status of ADP development in the Department and analyzed and projected departmental requirements and goals. A special study also was made of the feasibility of creating a Natural Resources Data Center, and several proposed administrative and program ADP applications and developments were reviewed. As a result, a special central ADP coordinating and systems planning staff is to be established in the 1964 fiscal year to control and guide the accelerating departmentwide ADP program.

As part of its general responsibility for providing staff leadership in a continuing program of management improvement in bureau and office operations, the Division furnished a major portion of the staff support for the Department's role under the Government-wide manpower utilization program sponsored by the Bureau of the Budget. An important objective of this program is establishment of means to assess or measure the productivity and effectiveness of operations. The Division also conducted a special conference on the role of management analysts in manpower utilization.

Management analysts of the Division studied organizational, procedural, and other administrative management problems. Typical were: A study of the role and functions of the Office of the Science Adviser; a major reorganization of the Bureau of Mines; organization and managment plans for the prospective Youth Conservation Corps; revision of civil defense and emergency mobilization plans; and a review of the regional office organization and staffing of the Bureau of Commercial Fisheries.

Staff supervision over the incentive awards and work improvement activities of the bureaus and offices was provided by the Branch of Incentive Awards. This included honor awards, as well as awards for suggestions and inventions, superior performance, and special acts or services.

## Personnel Management

The Division of Personnel Management maintained primary staff responsibility for the Department's policies and programs for establishing and maintaining a qualified and efficient working force. For the second consecutive year, a special team of recruiters visited 40 Negro colleges to interest promising young men in semiprofessional summer employment in the Department. The primary purpose was to encourage such persons to establish a career in conservation of the Nation's resources. Ninety-two summer jobs in several bureaus of the Department were filled by students from Negro colleges. These candidates had been recommended by officials of the colleges and were interviewed by a recruiter of the Department. College officials responded enthusiastically to this program.

Emphasis was given to implementing Executive Order 10988 on "Employee-Management Cooperation in the Federal Service." At the outset of the year, a pamphlet was issued embodying all the Department's instructions on the subject. This was for departmental use as well as for answering public inquiries regarding employee-management relations policies of the Department. Each employee received a pamphlet, "Facts About Employee-Management Relations." Copies were supplied, on request, to many Government agencies and employee unions.

Sixty employees completed the Department management training programs of 5 or 7 months' duration in Washington. The number of departmental employees participating in interagency training programs throughout the country increased along with departmental employees taking part in long-range programs including university-level training. In Washington, D.C., 104 employees completed foreign-language courses conducted by the staff of the George Washington University.

New reporting techniques and procedures were developed to refine Department analysis of accidents to people and to property and to identify the management problems involved. For the seventh consecutive year since the inception of the safety function under personnel management, the rate of disabling work injuries decreased.

## Property Management

The Department's contracting and procurement activities continued to stress a policy of advancing economic benefits to labor-surplus areas and to small business firms. The requirement for bonding Property Accountability Officers was discontinued during the year, thus saving the cost of premiums.

During the year, personal property acquired at a cost of approximately $675,000 was found surplus to Interior programs and was donated to public schools and hospitals through the Donable Property Program of the Department of Health, Education, and Welfare.

In accordance with a request from the Chairman, Committee on Government Operations, House of Representatives, a survey was conducted to determine the estimated current-day value of real property held by the Department in Idaho, Oregon, and Washington. Survey results will be used to determine the feasibility of a project to determine the estimated current-day value of real property holdings on a Government-wide basis.

During the year, approximately 50,000 cubic feet of records were disposed of, releasing space and filing equipment for other use. This was accomplished through the destruction of valueless records and the transfer to Federal records centers of inactive records of continuing value. Use of open-shelf filing instead of more expensive filing cabinets was expanded. Considerable progress was achieved in converting bureau radiotelephone equipment to "narrow-band" or "single-side-band" type of emission. This created significant economy in frequency spectrum space. The Division's communications engineer helped prepare the final U.S. proposals for the International Telecommunications Union Conference. This will allocate frequencies for space services.

Almost 400 radio frequency assignments were made for bureaus and offices.

## Security

The Division of Security was responsible for maintaining security throughout the Department and played a major part in coordinating the Department's defense activities. The Division also was concerned with departmental direction and coordination of a radiological defense training program and coordination under the Federal Disaster Act of 1950.

# Office of the Solicitor

## Frank J. Barry, Solicitor

All the legal work of the Department of the Interior is performed under direction of the Solicitor. In discharging his duties the Solicitor is assisted by the Deputy Solicitor and a staff of attorneys in Washington, D.C., and in strategically located field offices.

During fiscal 1963, the number of matters considered in the Office of the Solicitor reached a new high. During the year, 159,611 items were disposed of and approximately 62,000 hours were spent in giving oral advice and attending meetings and conferences.

Because of an extremely high backlog of public land appeals which reached a peak of 798 cases on July 31, 1962, and mounting criticism over long delays in disposing of cases, substantial efforts were made to work out procedures which would help reduce the backlog of appeals. One of the steps was a delegation of authority to the Assistant Solicitor, Land Appeals, to sign decisions and to refer all land classification and similar discretionary cases to the Office of the Assistant Secretary for Public Land Management for direct disposal by letter decisions. The backlog of 792 cases at the beginning of the fiscal year was reduced to 624 cases at the close of the year.

The Division of Legislation, under the direction of the Legislative Counsel, is responsible for coordinating the preparation of all legislative materials of the Department, except appropriations, and the testimony of departmental witnesses before the various congressional committees. During the first 6 months of the 88th Congress the Office prepared reports on 418 bills and prepared 81 legislative proposals for submission to the Congress. Included among the new laws enacted during this period is the statute providing basic authority to the Secretary of the Interior for research, planning, and coordination with respect to Federal outdoor recreation activities.

The June 3, 1963, decision of the Supreme Court in *Arizona v. California* culminated an original action which has been pending since 1952, involving the rights of the States of Arizona, California, and Nevada and of the United States in the waters of the Lower Colorado River and its tributaries. The Court said that the Boulder Canyon Project Act (43 U.S.C., sec. 617 *et seq.*), embodies a comprehensive scheme for apportioning the mainstream waters of the Lower Colorado River among California, Arizona, and Nevada. The Secretary of the Interior is authorized to allocate mainstream waters among the States of the Lower Colorado River Basin and to determine which water users within each State shall receive water under the standards prescribed in section 5 of the Boulder Canyon Project Act (43 U.S.C., sec. 617d). The Court held that in any year when 7,500,000 acre-feet of mainstream Colorado River water is available for lower basin consumptive use, the prescribed allocation had been made by the Secretary in the basic water-delivery contracts with the States of Arizona and Nevada and with water users in California. The Court further held that the Secretary ". . . is free to choose among the recognized methods of apportionment or to devise reasonable methods of his own" in apportioning shortages (in years when less than 7,500,000 acre-feet of water are available for beneficial consumptive use), although he must follow the standards set forth in the act, including the requirement that he respect "present perfected rights" (i.e. water rights perfected as of June 25, 1929, the effective date of the Boulder Canyon Project Act). At year's end, the final decree was yet to be formulated and the Court also had before it a petition for rehearing filed by California. However, the opinion was a major step in delineating the rights of the States and the United States to take water for existing and new uses and in removing the uncertainty which, since 1951, had prevented congressional consideration of Lower Colorado River Basin development.

***Dugan v. Rank*** and ***City of Fresno v. California et al.***, arose out of the operation of Friant Dam on the San Joaquin River in California. Water of the San Joaquin River is impounded by Friant Dam and devoted to uses elsewhere in the Central Valley Project for the irrigation of lands. Certain landowners below Friant Dam contended that they were deprived of water that would have been available but for the existence of the Federal dam and brought suit in 1947 seeking to enjoin diversion and storage of water.

The Supreme Court ruled that an injunction would not lie against either the United States or local officials of the Bureau of

Reclamation, and that any relief to which affected interests ma be entitled is limited to suit for damages under the Tucker Act.

The Court concluded that the Government, through its officer acting under authorization of Congress, had the power ". . . t seize the whole or respondent's rights in carrying out the Cor gressional mandate," and that ". . . the federal officers *a fortio* had authority to seize less." 372 U.S. at 623. The Court als rejected the contention that the Government was required t announce that it was taking water rights to a specified number o gallons or inches of water. The Court ruled that this qualitativ uncertainty does not preclude the ascertainment of the value o the taking.

In ***Best v. Humboldt Placer Mining Co.,*** the United States ha sued in a Federal district court to condemn certain propert needed for construction of a dam. The property was subject t outstanding mining claims. While seeking immediate possession the United States sought to reserve authority to determine th validity of the claims in administrative proceedings before the Department. The district court allowed the United States a writ o possession but decided no other issues in the case. The Suprem Court, after emphasizing the plenary authority of the Departmen of the Interior and its broad authority to issue regulations concerning the administration of public lands, stated that the institution of the condemnation suit in the district court was not inconsistent with the administrative remedy for determining the validity of mining claims.

The Court upheld the issuance of the writ of possession and ruled that the district court had acted properly in ". . . holding its hand until the issue of the validity of the claims has been resolved by the agency entrusted by Congress with the task."

In ***Boesche v. Udall,*** the Court upheld the authority of the Secretary of the Interior to cancel, in an administrative proceeding, a noncompetitive oil and gas lease on public land where the lessee, in making application, had failed to comply with a departmental regulation. The Court rejected the contention that section 31 of the Mineral Leasing Act (30 U.S.C., sec. 188), limits the Secretary's powers of administrative cancellation to instances where a lessee fails to comply with the terms of the lease, and requires judicial action to cancel a lease for the lessee's failure to comply with a departmental regulation.

Some of the more significant legal opinions rendered by the Office of the Solicitor are summarized as follows:

In an opinion dated March 18, 1963 (M-36653), the Solicitor held that the Secretary was without authority to defer closing the water diversion tunnels at Glen Canyon Dam until works were constructed for the protection of Rainbow Bridge National Monument.

The Solicitor, in an opinion dated December 18, 1962 (M-36643), advised that water-project construction agencies were authorized to acquire lands for fish and wildlife conservation purposes in connection with projects not substantially completed as of the date of the enactment of the Fish and Wildlife Coordination Act.

In Solicitor's Opinion M–36644, dated November 29, 1962 (69 I.D. 203), it was held that executory lease agreements with competent Crow Indians which purport to cancel existing leases between the same parties as of a date 12 or 18 months in the future and to take effect themselves as 5-year leases at the future date violate the act of March 15, 1948 (62 Stat. 80), and are void.

During the year the Supreme Court decided four cases of great importance to the Department: **Arizona** *v.* **California**, 373 U.S. 546 (1963); **Dugan** *v.* **Rank**, 372 U.S. 609 (1963), and its companion case **City of Fresno** *v.* **California et al.**, 372 U.S. 627 (1963); **Best** *v.* **Humboldt Mining Co.**, 371 U.S. 334 (1963); and **Boesche** *v.* **Udall**, 373 U.S. 472 (1963).

# Resources Program Staff

## Henry P. Caulfield, Jr., Director

The Resources Program Staff, Office of the Secretary, performs two major functions: Central staff services and departmental coordination.

In its first area of responsibility, the Resources Program Staff assists and advises the Secretary and secretariat in the development and implementation of departmental policy and in the formulation of long-range objectives and programs regarding natural resources. The Staff also executes a variety of special assignments concerning development and conservation. In the area of departmental coordination, the Staff performs this function for activities which cut across major administrative lines defined generally by the type of resource—minerals, water and power, public lands, fish and wildlife. Staff members represent the Secretary on various departmental, interagency, national, and international committees, commissions, and similar bodies.

During fiscal 1963, until June 1, Charles H. Stoddard was Director. Henry P. Caulfield, Jr., Assistant Director under Mr. Stoddard, became Director July 11, 1963.

Principal areas of responsibility of the Resources Program Staff during fiscal 1963 follow:

### Program Planning Coordinated

Long-range planning and programing, instituted in 1962, was augmented to include concern for program matters related to preparation of the annual budget of the Department. The Secretary assigned the Staff, subject to the direction of the Under Secretary, the establishment of criteria, projections, and procedures for bureau programing. Long-range program plans were developed for soil and moisture conservation and range improvement and forestry. During the year the Staff was directed, in collaboration with the Division of Budget and Finance, to assist in review by the secretariat of the programs of the Department in conjunction with preparation of the Department's annual budget.

## Water Resources Planning and Coordination Emphasized

At the direction of the President, the Secretaries of the Interior, Army, Agriculture, and Health, Education, and Welfare—the four Secretaries who would compose the President's proposed Water Resources Council—continued to pursue matters of mutual concern. The Assistant Director represented the Department on the Interdepartmental Staff Committee established to advise the Secretaries in this regard and was Committee Chairman. Work progressed during the year on development of standards to supplement the Policies, Standards, and Procedures for the Formulation, Evaluation, and Review of Plans for the Use and Development of Water and Related Land Resources, approved by the President May 15, 1962.

Major accomplishments for the year were agreement on a four-department coordinated river basin planning budget report for fiscal 1964 and concurrence on new procedures designed to provide an improved coordinated budget report for fiscal 1965.

## Water Research Report Completed

A Task Group on water research coordination, on which the Staff is represented, completed its report, which was submitted to the Federal Council on Science and Technology. At year's end, the report was presented to the President and the Congress.

## Resource Economics Guided

The senior economist of the Staff was departmental liaison officer with the Council of Economic Advisers and the Consumers' Advisory Council and was a member of the Department Energy Policy Staff and chairman-secretary of various ad hoc interbureau work groups designated to assemble data required by the Secretary in responding to requests from congressional committees and others for economic information. He conducted special economic studies, as requested by the Secretary and Under Secretary, and advised other economists and economics units throughout the Department.

## International Activities Varied

The Staff provided departmental support for interagency efforts toward implementing the Trade Expansion Act of 1962 and represented the Department in preparations for the sixth round of tariff negotiations for the General Agreement on Tariffs and Trade (GATT).

Coordinated departmental efforts in support of the interagency United Nations Economic Committee were provided so that the natural resources expertise of the Department would be available to U.S. delegations to meetings of international organizations.

Work progressed with the Agency for International Development (AID) seeking modernization of the relationship between the two agencies and to give maximum support to AID under the Humphrey amendment to the Foreign Assistance Act of 1961.

The Staff continued to provide the support for the Secretary's participation in the Cabinet-level Joint United States-Canada Committee on Trade and Economic Affairs and the counterpart committee with Japan.

### Field Activities Coordinated

The Staff coordinated the regional field activities of the Department through regional coordinators, who are chairmen of six field committees. Regional coordinators, in conjunction with field committees, coordinated bureau programs in their regions, reconciled overlap and conflict problems, identified and developed project and program plans, and provided liaison with other Federal departments on interagency committees. A major reappraisal of this coordination function was accomplished during the year, resulting in restatement by the Secretary of responsibilities and procedures for its performance.

### Area Redevelopment Projects Reviewed

The Staff coordinated the Department's activities under the program of the Area Redevelopment Administration relating to areas of chronic unemployment and underemployment, where water, minerals, forestry, recreation, and fish and wildlife have an important role. A majority of the project proposals reviewed were for technical assistance, industrial or commercial loans, and public facility loans or grants. Projects approved by the Area Redevelopment Administration were monitored. The Staff participated in the activities of numerous interagency technical teams and task forces in reviewing resource projects in depressed areas, particularly in the southern Appalachian region, now the object of special concern of the President's Appalachian Regional Commission.

### Staff Active in Appalachian Studies

The Resources Program Staff has an active role in developing proposals for relief and development of the southern Appalachians, the most chronically depressed region in the United States. Subcommittees for which the Department has chief responsibility are those concerning power, coal and other minerals, and recreation. The Staff also was represented on subcommittees regarding water, forests, manpower and training, comprehensive program, transportation and finance. A comprehensive regional program is being developed.

## Accelerated Public Works Program Assisted

Since start of the Accelerated Public Works program, departmental participation has been coordinated by the Resources Program Staff. The Staff, through negotiation with the Area Redevelopment Administration, prepared allocation requests and obtained approval for construction projects for eight bureaus of the Department to the amount of $63 million. Major accomplishments of the Department under the program are described in reports of its several agencies.

## Strip Mine Reclamation Studied

The problems created by unrestored surface mining involve several bureaus of the Department. These concern erosion, sedimentation, stream pollution, loss of vegetation, destruction of wildlife and its habitat, destruction of scenic and recreational values, flood damage and economic loss in terms of land values, income, and taxable base. The Staff coordinated preliminary review studies of strip mining on private lands and on public lands under the control of the Department. These were preparatory to a possible nationwide and more intensive study.

## Plans Laid for Youth Conservation Corps

The Staff provided representation for the Department on the Interagency Committee established to plan a Youth Conservation Corps. It also coordinated and directed an extensive planning effort of the five bureaus which would participate in such a program. Comprehensive plans were developed so they can be made operational on short notice if the Corps were authorized by Congress.

## Special Staff Assignments Met

Additional major Staff duties include the assignment of various members to study teams, committees, and boards. The Director was a member of an Agency for International Development survey of agricultural development in Honduras. Staff members represented the Department on a variety of groups, in addition to those mentioned earlier, such as the International Champlain Waterway Board, the Commission on Conservation of the American Association of School Administrators, the North Cascades Study Team, and the Joint United States-Japan Committee on Trade and Economic Affairs.

# Office of the Science Adviser

## John C. Calhoun, Jr., Science Adviser

The Department's recognition of the importance of scientific and engineering research in the conservation and development of the Nation's natural resources increased the role of the Science Adviser during the year. He continued to serve as the Secretary's immediate consultant on the role of research to meet departmental objectives. This called for special reviews and studies on such subjects as pesticides and wildlife relationships, scientific manpower requirements, and the balance between research and operational programs. The Science Adviser's Office has undertaken increased responsibility for coordinating departmental research plans with other governmental and nongovernmental agencies. Extensive cooperation in this effort has been continued with the Office of Science and Technology, the National Science Foundation, the National Academy of Sciences, and other agencies.

Representation on the Federal Council for Science and Technology and cooperation with its various committees resulted in major departmental contributions to reports on water resources, natural resources, oceanography, energy, and scientific and technical information. The Science Adviser continued as Chairman of the Federal Council's Committee on Natural Resources, which is completing studies requested by the President on natural resources development and applications to meet national needs.

The Department's present and future programs of research on natural water systems to assure adequate supplies for domestic, power, agricultural, recreational, and other uses received primary attention from the Science Adviser. In this work departmental responsibilities were considered in relation to pending legislation on water resources research, interagency program planning and coordination, and in relation to State and university interests.

Dr. John C. Calhoun, Jr., of Texas Agricultural and Mechanical College succeeded Dr. Roger Revelle of the University of California as the Science Adviser in May 1963.

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Created in 1849, the Department of the Interior—a Department of Conservation—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.